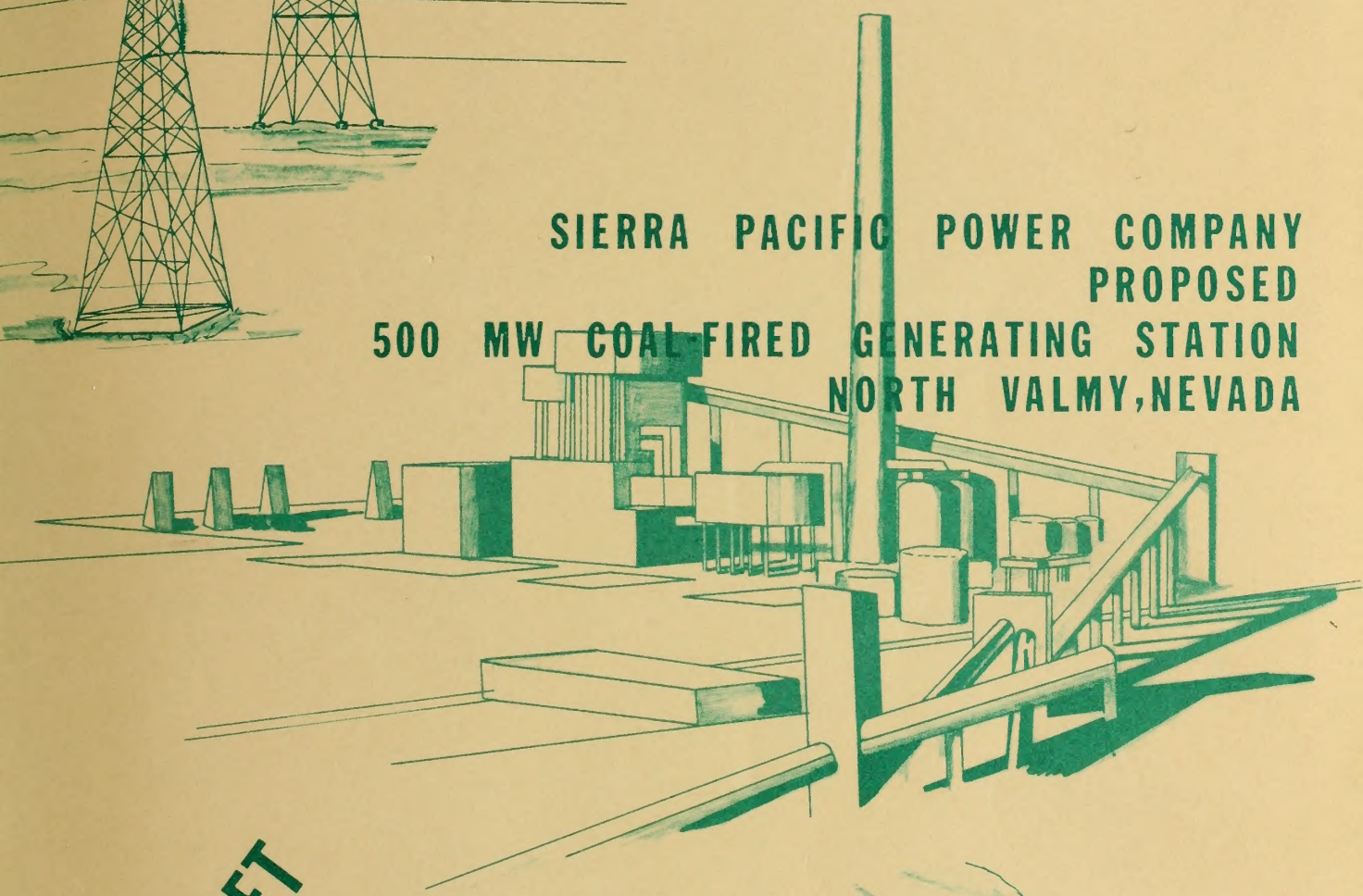
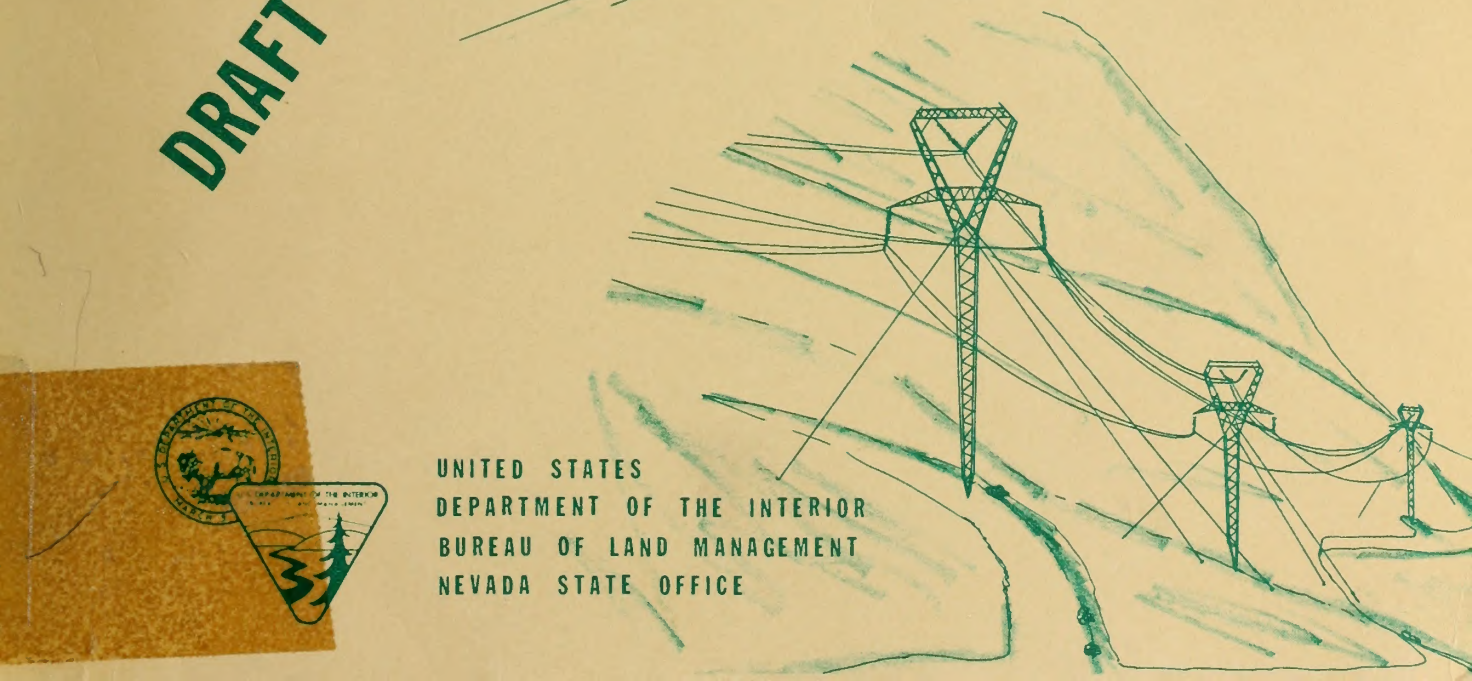
BLM LIBRARY
88013652

ENVIRONMENTAL STATEMENT

SIERRA PACIFIC POWER COMPANY
PROPOSED
500 MW COAL-FIRED GENERATING STATION
NORTH VALMY, NEVADA



DRAFT



UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
NEVADA STATE OFFICE

Bureau of Land Management
Library
Denver Service Center

8801652

INT DES 78-18

TD
195
S1E4
.72
N67
1978

BLM Library
D-553A, Building 50
Denver Federal Center
P. O. Box 25047
Denver, CO 80225-0047

DEPARTMENT OF THE INTERIOR

DRAFT
ENVIRONMENTAL STATEMENT

SIERRA PACIFIC POWER COMPANY
PROPOSED
500 MW COAL-FIRED GENERATING STATION
NORTH VALMY, NEVADA

Prepared by:
U. S. Department of the Interior
Bureau of Land Management
Nevada State Office
Reno, Nevada

State Director, Nevada

Bureau of Land Management
Library
Denver Service Center

SUMMARY

(X) Draft ( ) Final Environmental Statement

Department of the Interior
Bureau of Land Management
Nevada State Office

1. Type of Action: (X) Administrative ( ) Legislative

2. Brief Description of Action: Sierra Pacific Power Company, Reno, Nevada, proposes to construct two 250 megawatt (Mw) coal-fired steam-electric generating units in Humboldt County, Nevada. Two transmission lines would deliver power to substations near Austin and Reno, Nevada. Coal would be purchased from an existing mine in Utah and shipped via rail to the plant. Construction of the proposed power plant would involve acquisition of title to a total of 3,100 acres, 940 acres (30 percent) of which are Federally administered.

3. Summary of Environmental Impacts: As designed (with a bag-house particulate control system and no desulfurization equipment) the project would emit at full load 0.9 tons of fly ash, 47 tons of sulfur dioxide, and 42 tons of nitrogen dioxide per day to the atmosphere. Approximately 375 tons of captured fly ash and 94 tons of bottom ash would be landfilled at the site each day.

Each unit would consume an estimated 3,830 acre-feet of groundwater and 700,000 tons of coal per year.

Approximately 912 acres of soil would be disturbed at the plant site and from 795 to 874 acres disturbed from transmission system construction, depending on the route selected. This soil disturbance from plant and transmission line construction would result in increased erosion and loss of vegetation.

A peak construction work force of 450 workers is estimated, with an eventual operating staff of 60 employees causing population increases in the communities of Battle Mountain and Winnemucca.

4. Alternatives Considered: Alternate sites, design, and operation of the plant; Alternatives to the location and design of the transmission system; Alternate means of meeting the project objectives including conservation and energy sources; and Alternatives to the proposed implementation schedule and authorizing actions.

5. Comments Have Been Requested From the Following: See list in Chapter 9, p. 9-6 .

6. Date Statement Made Available to CEQ and the Public:

Draft Statement: MAY 11 1978

TABLE OF CONTENTS

Page

Summary iii

List of Maps x

List of Tables xi

List of Figures xvii

List of Photographs xviii

Preface xix

1. DESCRIPTION OF THE PROPOSED ACTION

Introduction 1-1

Purpose and Objectives 1-3

Authorizing Federal, State, and Local Actions 1-4
Federal Agency Actions; State Agency Actions; Local Agency Actions

Interrelationships with Other Projects and Proposals 1-7

Applicant's Proposed Action 1-8
Power Plant Complex; Transmission System; Communications System

2. DESCRIPTION OF THE ENVIRONMENT

Introduction 2-1

Existing Environment 2-1
Topography; Geology; Seismic Activity; Soils, Climate; Air Quality; Water Resources; Vegetation; Wildlife; Wild Horses; Land Uses and Ownership; Recreation; Wilderness; Cultural Values; Visual Resources; Social-Economic Conditions

Future Environment Without the Proposed Action 2-90

3. ENVIRONMENTAL IMPACTS OF THE PROPOSED ACTION

Introduction 3-1

Topography 3-2
Power Plant Complex; Transmission and Communications Systems

TABLE OF CONTENTS(CON'T)

Page

Geology 3-3
Power Plant Complex; Transmission and Communications Systems

Seismic Activity 3-4
Power Plant Complex; Transmission and Communications Systems

Soils 3-6
Power Plant Complex; Transmission and Communications Systems

Climate 3-10
Power Plant Complex; Transmission and Communications Systems

Air Quality 3-12
Emissions; Ambient Air Conditions; Other Particulate Sources; Trace Elements; Cooling Tower Drift and Ozone; Visibility

Water Resources 3-21
Groundwater; Surface Water; Water Quality

Vegetation 3-27
Power Plant Complex; Transmission and Communications Systems; Threatened or Endangered Flora

Wildlife. 3-33
Power Plant Complex; Transmission and Communications Systems; Threatened or Endangered Species

Wild Horses 3-40

Land Uses 3-41
Land Characteristics; Planning and Zoning; Agriculture; Mineral Activities; Transportation; Utilities

Recreation 3-45
Power Plant Complex; Transmission and Communications Systems

Wilderness 3-47

Cultural Resources 3-48
Paleontological Resources; Archaeo-Historical Resources

Visual Resources 3-50
Power Plant Complex; Transmission and Communications Systems

TABLE OF CONTENTS(CON'T)

Page

Social-Economic Conditions. 3-55
Service Area; Environmental Statement (ES) Area; Transmission and Communications Systems

4. MITIGATING MEASURES

Introduction 4-1

Measures Required by Federal Agencies 4-4
Bureau of Land Management (BLM); Federal Aviation Administration (FAA); National Park Service (NPS)

Measures Required by State and Local Agencies 4-15
General Measures; Nevada State Highway Department; Nevada Department of Conservation and Natural Resources, Division of Environmental Protection Services

Applicant Committed Measures. 4-18

5. UNAVOIDABLE ADVERSE IMPACTS

Soils 5-1

Air Quality 5-2

Water Resources 5-2

Vegetation 5-3

Wildlife 5-3

Land Uses 5-5

Recreation 5-5

Cultural Resources 5-6

Visual Resources 5-6

Social-Economic Conditions 5-7

6. THE RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIROMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY 6-1

Page

7. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Soils 7-1

Air Quality 7-1

Vegetation 7-2

Wildlife 7-2

Land Uses 7-3

Cultural and Paleontological Resources 7-3

Visual Resources 7-3

Coal Resource and Construction Materials 7-4

8. ALTERNATIVES TO THE PROPOSED ACTION

Energy Conservation 8-2

Purchase and Import Power 8-4

Alternate Means of Generation 8-5
Oil-Gas; Hydroelectric; Nuclear; Geothermal; Solar; Wind; Organic Waste

Alternatives to the Proposed Design and Operation of the Power Plant Including Location 8-10
Alternative Sites; Mine-Mouth and Load Center Alternatives; Alternative Cooling Systems; Alternative Emission Control Systems; Alternative Coal Transportation

Alternatives to Implementation Authorization 8-21
Authorizing Actions; Delay of Construction; No Action Alternative

Transmission Line Alternatives 8-23
Alternative Routes; Technical Alternatives

9. CONSULTATION AND COORDINATION

Consultation and Coordination in the Preparation of the Draft Environmental Statement 9-1

Coordination in the Review of the Draft Environmental Statement 9-6

TABLE OF CONTENTS(CON'T)

	Page
Public Hearing	9-9
10. APPENDICES	
A. Climate	10-1
C. Soils, Geology, and Mineral Resources	10-9
D. Water Resources and Water Quality	10-27
E. Wilderness Resources	10-33
F. Visual Resources	10-35
G. Social-Economic Factors (including summary of need data)	10-45
11. GLOSSARY	11-1
12. BIBLIOGRAPHY	12-1

LIST OF MAPS

	Page
Sierra Pacific Power Company Service Area Map, Nevada and California	1-2
Environmental Statement (ES) Area	1-11
Plant Site Area Land Status Map	1-13
General Layout of the North Valmy Project	1-14
Existing and Proposed Transmission Lines	1-37
Site Location and Geology	2-4
Seismic Risk	2-6
ES Area Soil Groups	2-9
ES Area Vegetation	2-31
ES Areas Big Game	2-41
ES Area Upland Game Birds	2-43
ES Area Waterfowl, Fisheries, and Raptors	2-45
ES Area Wild Horses	2-49
ES Area Land Status	2-53
ES Area Recreation Values	2-57
Potential Wilderness Study Areas	2-63
ES Area Cultural Resources	2-67
Archaeological Survey (Plant Site Area)	2-70
ES Area Visual Resource Management Classes	2-75
Lovelock District Irrigated Agricultural Potential	2-96
ES Area Visual Impacts	3-53
Alternative Sites	8-13
Proposed Alternative Segment	8-24
ES Area Metal Mining Districts	10-23
ES Area Industrial Mineral Deposits	10-25

LIST OF TABLES

		Page
1-1	Land Areas Affected by the North Valmy Station Construction Activities	1-10
1-2	Fuel Consumption and Stack Emissions	1-18
1-3A	SUFCO Coal Properties, North Valmy Station	1-20
1-3B	SUFCO Coal Trace Element Analysis	1-21
1-4	Cooling Tower Parameters	1-26
1-5	Chemical Usage--One Unit	1-27
1-6	Stack Parameters	1-28
1-7	Estimated Volumes of Solid Wastes Produced	1-29
1-8	North Valmy Station Yearly Operational Employment and Families	1-31
1-9	Primary Construction Materials Required	1-32
1-10	Construction Force Composition	1-34
1-11	Annual Peak Construction Labor and Families	1-35
1-12	Land Ownership by Transmission Line Corridor Segment	1-38
1-13	Transmission Line Construction Materials Required	1-39
1-14	Summary of Land Requirements and Surface Disturbance (in Acres)	1-42
1-15	Site and Related Information, Existing and New Microwave Sites	1-46
2-1	Destructive and Near-Destructive Earthquake Epicenters Within 100 Miles of the North Valmy Site.	2-5
2-2	Record and Average Temperatures	2-13
2-3	Fastest Wind Speeds	2-14

LIST OF TABLES(CON'T)

		Page
2-4	Percentage Frequency of Wind Direction in Speed Classes During Stable Conditions for the Height Layer 440-2,035 Feet Above Ground Level	2-16
2-5	Number of Elevated Inversions (Measured at the Top) By Height Intervals for Morning and Afternoon During 1975-1976 at Valmy, Nevada	2-18
2-6	Frequencies of Radiation Inversions (Measured at the Top) By Height Invervals for Morning and Afternoon During 1975-1976 at Valmy, Nevada	2-19
2-7	Summary of Background Air Quality Measurements, North Valmy Site	2-22
2-8	Average River and Stream Discharge	2-25
2-9	Predicted Flood Flows, Humboldt River Basin	2-27
2-10	Predicted Flood Flows (50-Year Recurrence Interval) Truckee and Carson River Basins	2-27
2-11	Vegetative Types on the North Valmy Station Site	2-29
2-12	Representative Plant Species by Vegetative Type	2-30
2-13	Threatened or Endangered Flora, Valmy ES Area	2-36
2-14	Animal Species Representative of the ES Area	2-38
2-15	[deleted]	
2-16	Sierra Pacific Power Company Service Area Population--1970-1975	2-78
2-17	Establishment-Based Industrial Employment, Sierra Pacific Power Company Service Area--1975	2-79
2-18	Reno SMSA Establishment-Based Industrial Employment--1975	2-79
2-19	Employment by Industrial Sector, Humboldt County--1970 and 1974	2-81
2-20	Employment by Industrial Sector, Lander County--1970 and 1974	2-82

		Page
2-21	Local Government Appropriation Fund Requirements	2-83
2-22	Winnemucca Housing Profile	2-84
2-23	Student Population by Group Classification, Humboldt and Lander Counties--1975-1976	2-85
2-24	School Capacity and Enrollment, City of Winnemucca	2-86
2-25	School Capacity and Enrollment, City of Battle Mountain	2-86
2-26	Law Enforcement Manpower	2-87
2-27	Local Juvenile Probation Personnel	2-88
2-28	Offense and Arrest Statistics, Humboldt and Lander Counties	2-88
2-29	Sierra Pacific Power Company Service Area Population Estimates--1980, 1985, 1990, and 2000	2-90
2-30	Reno SMSA Establishment-Based Industrial Employment--1976, 1980, and 1985	2-91
2-31	Population Estimates, Humboldt and Lander Counties and Associated Communities--1975, 1980, 1985, 1990, and 2000	2-93
2-32	Lovelock District Irrigated Agricultural Potential	2-97
2-33	Potential Wilderness Study Areas	2-62
3-1	Comparison of Trace Element Particulate Deposition with Baseline Concentrations in Soils at the North Valmy Site	3-7
3-2	Potential for Occurrence of Ground Fog and Icing Due to Cooling Tower Operations, North Valmy Station	3-11
3-3	Calculated Emission Rates Per Unit	3-12
3-4	Applicable Ambient Air Quality Standards	3-13

LIST OF TABLES(CON'T)

		Page
3-5	Short- and Long-term Maximum Ground Level Concentrations for Particulates and Nitrogen Dioxide	3-14
3-6	Summary of Predicted Sulfur Dioxide Concentrations	3-14
3-7	Predicted Emissions of Selected Trace Elements Per 250 Mw Unit (100 Percent Load)	3-17
3-8	Estimated Ground Level Concentrations of Selected Gaseous Trace Elements and Radioactive Elements (for Two Units)	3-17
3-9	Wildlife Impacts--Transmission Line Construction	3-35
3-10	Wild Horse Habitat	3-40
3-11	Average Daily Traffic at Corridor-Highway Crossings	3-44
3-12	Lander County and Battle Mountain Population Estimates and Project Work Force	3-56
3-13	Humboldt County and Winnemucca Population Estimates and Project Work Force	3-56
3-14	Project Construction and Operation Employment Population and Secondary Employment Population	3-57
3-15	Annual Peak Construction and Operational Employment and Employment Multiplier, North Valmy Station	3-58
3-16	Income (Thousands of Dollars)	3-59
3-17	Estimated Total Retail Sales, Humboldt and Lander Counties	3-61
3-18	Estimated Property Tax Revenues, North Valmy Station	3-62
3-19	Estimated Community Housing Needs, Construction and Operation Employees	3-63

LIST OF TABLES (CON'T)

		Page
3-20	School Enrollment and Peak Employment, Winnemucca, (Humboldt County)	3-64
3-21	School Enrollment and Peak Employment, Battle Mountain, (Lander County)	3-64
3-22	Estimated Peak Additional School Enrollment	3-65
3-23	Estimated Tax Assessment and Revenues (By Corridor and County) for the Transmission System	3-70
3-24	Summary of Major Impacts by Corridor and Plant Site	3-72
5-1	Unavoidable Impacts to Vegetation by Project Surface Disturbance	5-4
8-1	Site Selection Sequence	8-12
8-2	Emission Rates Per Unit	8-19

APPENDIX TABLES

A-1	Summary of Climatological Features, Winnemucca, Nevada	10-2
A-2	Precipitation	10-3
A-3	Monthly Precipitation Summaries (Winnemucca Weather Station)	10-4
A-4	Maximum Calculated Point Rainfall Values in Valmy Site Area	10-5
A-5	Maximum Recorded Point Rainfall (in inches)	10-5
A-6	Monthly Mean Thunderstorm Days, Winnemucca, Nevada	10-5
A-7	Mean Temperatures Summary	10-6
A-8	Monthly Temperatures Summary (Winnemucca Weather Station)	10-7

LIST OF TABLES(CON'T)

		Page
A-9	Mean Relative Humidities (Winnemucca Weather Station)	10-8
C-1	Soil Phases and Interpretations, Project Site and ES Area	10-10
C-2	Some Characteristics of Soil Subgroups in the ES Area	10-19
C-3	Trace Element Concentrations in Valmy, United States, and World Soils	10-20
C-4	Stratigraphy of a Typical Section at the North Valmy Site	10-21
D-1	Quality Standards for Class C Waters	10-28
D-2	Water Quality of the Humboldt River at Battle Mountain and Winnemucca	10-29
D-3	Suface Water Quality of the Humboldt River at Battle Mountain and Winnemucca	10-30
D-4	Chemical Analysis of Water from Test Holes	10-31
D-5	Quality of Waters in Selected Wells near the North Valmy Station	10-32
G-1	Annual One-hour Peak Demand (Mw)	10-49
G-2	Energy Requirements, 1970-1986	10-50
G-3	List of Counties and Subdivisions	10-51
G-4	Humboldt County Local Government Taxing Units Assessed Valuation	10-52
G-5	Lander County Local Government Taxing Units Assessed Valuation	10-53
G-6	Humboldt County Personal Income by Major Sources	10-54
G-7	Lander County Personal Income by Major Sources	10-55
G-8	Sierra Pacific Power Company System One-hour Peak Demand	10-56

		Page
G-9	Electric Customer Growth 1967-1976 (Actual)	10-57

LIST OF FIGURES

1-1	Estimated Construction Schedule	1-9
1-2	Layout of the North Valmy Station	1-15
1-3	Expected Major Emissions, North Valmy Station	1-17
1-4	Proposed Locations of Well Field and Pipelines . . .	1-24
1-5	Valmy Plant Water System	1-25
1-6	Typical Transmission Line Towers	1-40
2-1	Locations of Climatological Stations and Meteorological Instruments	2-12
2-2	Wind Roses	2-15
2-3	Total Suspended Particulates, Annual Geometric Means	2-21
2-4	Average Monthly Flow of the Humboldt River	2-26
2-5	Annual Average Unemployment	2-81
3-1	Erosion Hazard	3-9
3-2	High Terrain Areas Potentially Affected by the Proposed North Valmy Station	3-15
3-3	Vegetative Types Affected by Plant Site Construction Activities	3-27
3-4	Miles in Each Vegetative Type	3-30
3-5	Degree of Visual Impact	3-51
C-1	Relationships Existing in Mineral Soils	10-22
G-1	1970 Population Distribution, Humboldt County	10-58
G-2	1970 Population Distribution, Lander County	10-59

Page

LIST OF PHOTOGRAPHS

Construction activity on private land, North Valmy project site 1-16

Bridge spanning the main channel of the Humboldt River near the proposed plant site 1-32

Typical transmission line tower 1-39

Typical access road required for transmission line construction 1-41

Truck used in transmission line construction. 1-43

Line stringing vehicles used in transmission line construction 1-43

PREFACE

This environmental statement is prepared pursuant to the National Environmental Policy Act of 1969 (NEPA), Public Law 91-190. It is the intent of the statement to present a full disclosure of anticipated impacts which would result from the construction and operation of the proposed North Valmy generating station, transmission lines, and communications system.

In developing the statement, an attempt has been made to present materials in a concise manner with the focus on real environmental issues and alternatives.

Recognizing that other public agencies are charged with approval authority over various aspects of the proposal, this statement draws from these agencies' work to the extent possible in order to avoid duplication of effort.

In order for the reader to better understand the context or background from which the statement was developed the following items are presented.

Nevada Public Service Commission Approval

On June 29, 1977, the Nevada Public Service Commission issued on opinion and order granting a permit for Unit #1 of the proposed North Valmy station. This same order, however, denied construction of Unit #2 and stated that a new application must be filed at such time as Sierra Pacific wishes the Commission to again consider approval of Unit #2. This order approved Unit #1 with the stipulation that common facilities necessary for both units may be constructed, but that they are to be "limited to the bare minimum necessary." Even though Unit #2 has been denied by the State of Nevada's Public Service Commission this statement will evaluate and analyze impacts based on construction of both units as stated in the Applicant's proposed action.

Role of Westinghouse Electric Corporation

Westinghouse Electric Corporation, Environmental Systems Division, has served as the prime consultant to Sierra Pacific Power Company throughout the planning stages of the proposed North Valmy project. As such, they have published two detailed documents which are referenced extensively in this environmental statement and which have been submitted as support documents with Sierra Pacific's applications to other agencies for project approval. These docu-

ments are titled (1) Power Plant Site Selection Study for the Sierra Pacific Power Project, June 1975, and (2) Environmental Report for the North Valmy Station, March 1976. The second document is referred to in this statement as the Applicant's Environmental Report.

Need for the Project

An independent analysis of need for the project is not included in this environmental statement. The Nevada Public Service Commission is charged, among other factors, with determining the basis of need for all projects they approve. The Commission has conducted a comprehensive analyses of Sierra Pacific's stated need for the North Valmy station. Through established review and public hearing procedures the topic of need was examined by the Commission and a public record of testimony developed. Based on this record and evidence the Commission found, in part, "That the need for construction and the in-service date of Valmy Unit No. 2 and its associated transmission lines was not established by the evidence of record in this case."

Because of this public record and the statutory responsibilities of the Public Service Commission to establish the basis of need for the project this environmental statement does not reiterate these points or develop new data pertaining to need. However, Appendix G, p. 10-46 , presents a summary of the Applicant's stated need and of the Commission's subsequent findings.

Air Quality Analysis

The Nevada Division of Environmental Protection Services and the U. S. Environmental Protection Agency both have review and approval authority over the proposed project as a source of air pollutants. Both agencies have reviewed the Applicant's analysis methodologies and impact projections as well as completing their own independent studies and have developed impact projections which compare favorably with those offered by the Applicant. Based on these findings it has been determined that additional air quality analyses need not be developed for purposes of this statement.

Coal Source

The selected coal source for Unit #1 of the proposed project is an existing underground mine located in central Utah. This mine is operating under previously issued government leases and its operations, both present and future, have been the subject of separate environmental analysis. Given this background and the fact that the mine's continued operations are not contingent on the Applicant's purchase commitment, the mining operations are not considered as distinct actions under the proposal and are not included as such in this statement. A more detailed discussion of the coal source for the project is found in the coal section of Chapter 1, p. 1-19 .

Relationship Between the Proposed Valmy Project and the Oreana-Hunt Transmission Line

On July 11, 1977, a Final Environmental Statement (INT FES 77-52) for the proposed Oreana, Nevada, to Hunt, Idaho, 345 kilovolt (kv) transmission line was filed with the Council on Environmental Quality. This proposed transmission line (planned by Sierra Pacific Power Company) would pass through the location of the proposed North Valmy power plant, and would connect with an existing 345 kv transmission line extending from Sierra Pacific's Tracy power plant near Reno to the Oreana substation.

Sierra Pacific Power Company intends to use the Tracy-Oreana transmission line and that portion of the Oreana-Hunt transmission line between Oreana and Valmy to carry electricity generated by the proposed Unit #1 to Reno. Electricity could also be delivered to Idaho by means of the Oreana-Hunt 345 kv transmission line.

Further information on these existing and proposed lines can be found in the Final Environmental Statement, Proposed 345 Kv Transmission Line Oreana, Nevada to Hunt, Idaho (INT FES 77-52), and on p. 1-36 of this statement.

DESCRIPTION OF THE PROPOSED ACTION

1
DESCRIPTION OF THE PROPOSED ACTION

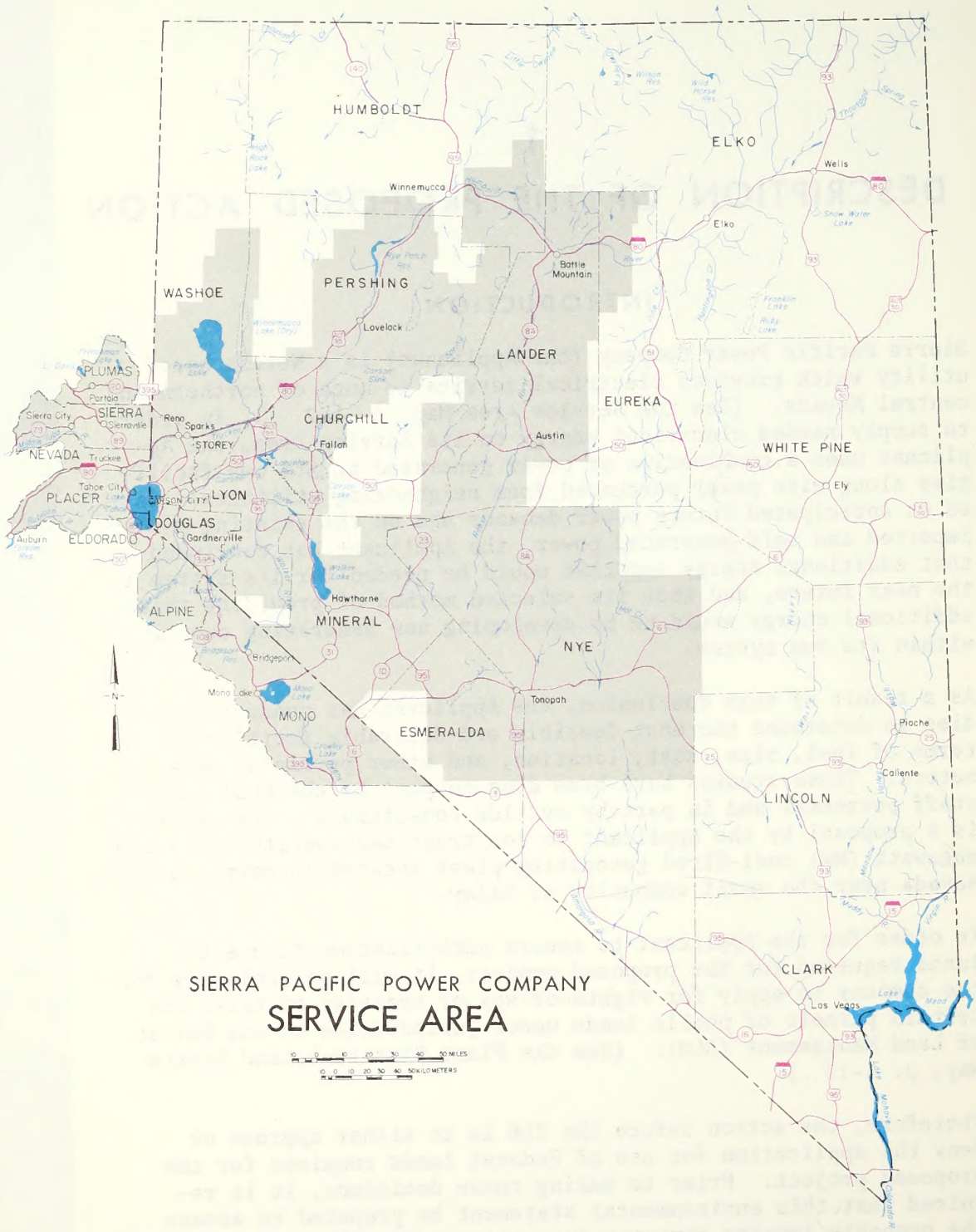
INTRODUCTION

Sierra Pacific Power Company (the Applicant) is a Nevada based utility which provides electrical service to much of northern and central Nevada. (See the Service Area Map, p. 1-2 .) In order to supply needed electrical energy to its Service Area, the Applicant uses a combination of power generated at its own facilities along with power purchased from neighboring utilities. Based on anticipated future power demands and on the existing mix of imported and self-generated power, the Applicant has concluded that additional energy supplies would be needed for its system in the near future, and that its selected method of providing this additional energy would be by developing new generating capacity within its own system.

As a result of this conclusion, the Applicant has conducted studies to determine the most feasible and desirable facility in terms of fuel, size, cost, location, and other pertinent parameters. These studies have been done in part by the Applicant staff personnel and in part by outside consultants. The result is a proposal by the Applicant to construct and operate a new 500 megawatt (Mw) coal-fired generating plant located in north-central Nevada near the small community of Valmy.

In order for the Applicant to secure authorization to use the lands required for the proposed project, it will be necessary for the company to apply for rights-of-way or transfer of title for certain parcels of public lands under jurisdiction of the Bureau of Land Management (BLM). (See the Plant Site Area Land Status Map, p. 1-13 .)

Therefore, the action before the BLM is to either approve or deny the application for use of Federal lands required for the proposed project. Prior to making these decisions, it is required that this environmental statement be prepared to assess the probable impacts expected from the construction, operation, and termination of the proposed project.



SIERRA PACIFIC POWER COMPANY

SERVICE AREA

0 10 20 30 40 50 MILES

0 10 20 30 40 50 KILOMETERS

PURPOSE AND OBJECTIVES

The Applicant's stated purpose for this project is to provide 500 Mw of electrical power to meet projected needs within its system by 1984.

Based on the Applicant's estimates for the ten year period, 1977-1986, peak demand and energy requirements are projected to grow at annual rates of 6.6 and 6.8 percent, respectively. (A summary of the Applicant's stated need is presented in Appendix G, p. 10-46 .) For more detailed information concerning need for the project, the reader is referred to the Applicant's Environmental Report and the hearing record of the Nevada Public Service Commission (Docket No. 732, June 29, 1977).

AUTHORIZING FEDERAL, STATE, AND LOCAL ACTIONS

This section includes a description of the governmental actions which would be required in order to authorize or reject all or any part of the Applicant's proposed action. These actions include authorizations such as the granting of permits, licenses, rights-of-way, and/or patents.

Federal Agency Actions

Bureau of Land Management (BLM)

The BLM has the responsibility for preparation of this environmental statement and for authorization of the following actions affecting public lands:

1. Transfer of title to 940 acres of public land to Sierra Pacific Power Company. (The 940 acre requirement would remain the same if one or both generating units were built.) The actual vehicle for this transfer has not been identified; however, viable options could include either sale or exchange. These lands, located at the proposed plant site, are intermingled with parcels of private lands. (See the Plant Site Area Land Status Map, p. 1-13 .)

2. Issuance of a grant of right-of-way for construction of the 345 kv transmission line from Valmy to Austin for Unit #1. Depending on the final alignment, this line would cross from 73 to 85 miles of public lands.

3. Issuance of a grant of right-of-way for construction of the 230 kv transmission line from Valmy to Mira Loma, should Unit #2 be finally approved by the Nevada Public Service Commission. Depending on final alignment, this line would cross approximately 96 miles of public land.

4. Issuance of a grant of right-of-way for the water pipelines and the power distribution lines crossing approximately seven miles of public land between the project site and the identified well fields.

5. Issuance of a grant of right-of-way for the four microwave communications sites proposed to be located on public lands.

6. Issuance of such Temporary Use Permits as may be needed in conjunction with the construction of the proposed project.

Department of the Army, Corps of Engineers

No permits required for this project.

Environmental Protection Agency (EPA)

The Applicant must obtain a construction permit from EPA under provisions of the Prevention of Significant Deterioration of Air Quality regulations [40 Code of Federal Regulations (CFR) 52.21]. This application has been filed, and EPA has marked for issue February 28, 1978, air quality permits for both Unit #1 and #2.

Federal Aviation Administration (FAA)

The FAA must review the project to determine whether any of the structures will be aeronautical obstructions or hazards and to determine whether and how obstruction marking and lighting should be applied.

Federal Communications Commission (FCC)

The Applicant would be required to obtain a license from the FCC for the operation of the proposed microwave relay system.

State Agency Actions

State of Nevada, Department of Conservation and Natural Resources

Division of Environmental Protection Services. The Applicant is required to obtain a registration certificate from the Division of Environmental Protection Services granting approval to construct the various project components which are considered to be sources of air pollution. On June 21, 1977, public notice was issued of intent to issue Registration Certificates for the following project components: Unit #1 Boiler, Unit #2 Boiler, Auxiliary Boiler, Coal Handling System, Ash Handling System, and site disturbance.

Additionally, the Division must issue operating permits which approve, with or without restrictions, the operation of the proposed plant after construction (Nevada Air Quality Regulations, Article 3).

Division of Water Resources. The Division of Water Resources has issued valid permits Nos. 29004 through 29009 inclusive, and Nos. 29572 through 29575 inclusive, to appropriate underground water for use at the proposed North Valmy Station. Each permit

allows for diversion of 4.0 cubic feet per second (cfs) from an individual well, with a total combined annual duty of all permits of a maximum of 8,400 acre feet.

Public Service Commission

Under provisions of the Utility Environmental Protection Act [Nevada Revised Statutes (NRS) 704.820-704.900] the Commission must grant a permit prior to construction of any utility facility as defined. Granting of the permit is based on the Commission's findings and determination of need, environmental impacts, location, and the public interest. Based on its analysis and the record developed through the public hearing process, the Nevada Public Service Commission on June 29, 1977, issued a permit approving Unit #1 of the project as proposed, but denying approval of Unit #2. (See Appendix G, p. 10-46 .)

State Highway Department

The Applicant would be required to obtain permits for occupancy of State highway rights-of-way for transmission line crossings.

Nevada Department of Fish and Game

The Department of Fish and Game has approved construction of the access bridge across the Humboldt River. This approval was required for those aspects of the project which involved modification and stabilization of the stream banks and the river bed. (The bridge has already been constructed.)

Local Agency Actions

Humboldt County

The Applicant would be required to obtain from the county normal construction permits and business licenses, as required.

INTERRELATIONSHIPS WITH OTHER PROJECTS AND PROPOSALS

Through the Valmy substation and the Austin substation the proposed project would tie directly with two transmission line interties (#1 from Sigurd, Utah, to Ft. Churchill, Nevada, and #2 from Tracy, Nevada, to Hunt, Idaho) for delivery of power purchased from the Utah Power and Light System.

Other than the interrelationships within the Applicant's own system and, in turn, relationships to its neighboring utilities, BLM has identified no other significant connections between the proposed North Valmy project and any other existing or proposed, Federal, State, local or private projects, plans, or policies in the area affected by the proposal.

One area of concern, however, relates to the possibility of the North Valmy project effectively precluding additional industrial development in the area by using the available air quality increment for sulfur dioxide (SO_2). While there are no known projects proposed for the area, the possibility of eliminating certain types of industrial development does exist.

Some preliminary applications to the State of Nevada under the provisions of the Carey Act have been made for lands covering portions of the transmission line corridors. The Carey Act was passed by Congress in 1894 to aid the western states in reclamation and settlement of federally administered desert lands. Under this Act, citizens may apply to the State for tracts of desert land suitable for irrigated agriculture. Where these applications meet State requirements, the State may, in turn, apply to the Bureau of Land Management for transfer of these lands from Federal to State ownership. The State may then segregate the lands for agricultural development and settlement by the original citizen-applicant.

The State of Nevada is now in the process of screening these applications prior to formal application being made to the Bureau of Land Management. If the State of Nevada were to acquire title prior to the grant of right-of-way for the transmission line, the State would grant the rights-of-way through these areas. If the right-of-way were granted first, the right-of-way would be a reservation of the land transfer to the State, should these lands meet the necessary criteria under the Carey Act procedures.

At this time, formal applications to the BLM have not been made for either the transmission line rights-of-way or for Carey Act lands.

APPLICANT'S PROPOSED ACTION

This section describes the project proposal as submitted by Sierra Pacific Power Company. Recognizing that the proposed project is complex, this section is presented in a format which separates the project into two main components: the power plant complex and the transmission and communications systems. The text under these headings is further divided, where appropriate, into discussions of project construction and project operations.

All information presented in this chapter which deals with the actual design and operation of the proposed project has been provided by Sierra Pacific Power Company. The primary reference document used in developing this chapter and other sections of this statement has been the Environmental Report for the North Valmy Station, (March 1976) prepared for the Applicant by its environmental consultants, Westinghouse Electric Corporation, Environmental Systems Department. (This document is hereinafter cited in this statement as the Applicant's Environmental Report.) Since initial publication in March 1976, periodic changes have been incorporated into the report to reflect updated project design parameters. In the following discussion the major project components are discussed in some detail and are described using the most current design specifications available.

Power Plant Complex

As proposed by the Applicant, the North Valmy Station (without sulfur controls) would include the following: two 250 Mw generating units (commonly called Unit #1 and Unit #2), each with a coal-fired boiler, a turbine-generator unit, a baghouse for particulate control, a 500-foot stack, a mechanical-draft cooling tower, and a well field for necessary water supplies. In addition, the station would have a coal storage area, a coal supply and handling system, evaporation ponds for waste disposal, a landfill for ash disposal, a railroad spur, an access road, a fire protection system, a transmission system, a warehouse, and a main administration building. Figure 1-1, p. 1-9 , shows the Applicant's proposed construction schedule for Unit #1 and #2. The Applicant has stated that the "project life" would be 37 years.

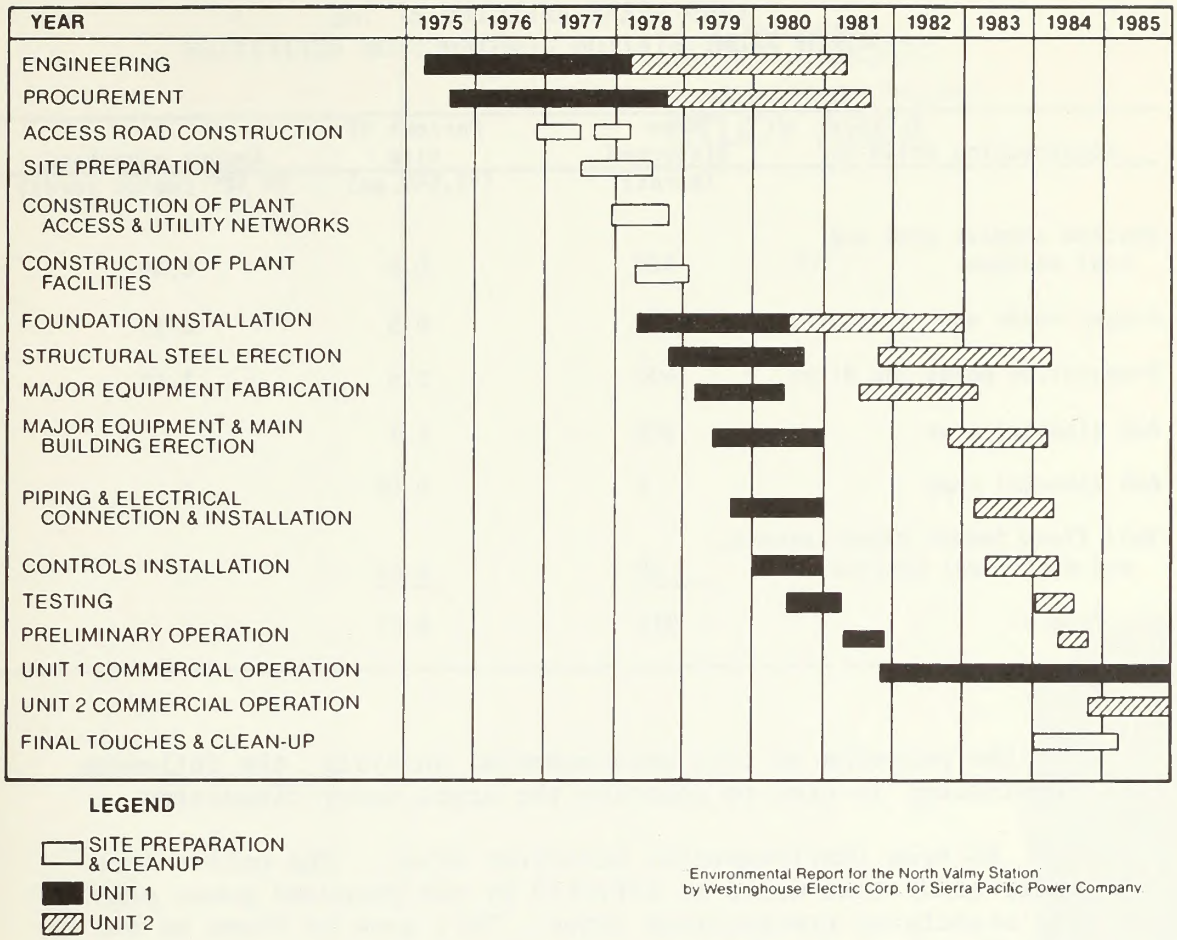


FIGURE 1-1 — ESTIMATED CONSTRUCTION SCHEDULE

Site Selection and Location

The location proposed by the Applicant is a 21.3 square mile (13,640 acre) area in Humboldt County, Nevada, near Valmy. The ES Area Map, p. 1-11 , and the Plant Site Area Map following show the general location of the proposed project. Figure 1-2, p. 1-15 , shows the specific location and structural arrangement of the power plant complex. Construction of the proposed project would involve acquisition by the Applicant of 940 acres of public land (30 percent of the total 13,640 acre area).

While the land area required for the actual power plant complex would be about 1.5 square miles (912 acres), the Applicant has stated that the larger plant site area is desired to insure that non-compatible land uses would not occur in the immediate vicinity of the proposed project. (Table 1-1, p. 1-10 , shows the land areas potentially affected by the proposed project.)

TABLE 1-1
LAND AREAS AFFECTED BY THE
NORTH VALMY STATION CONSTRUCTION ACTIVITIES

Construction activity	Area disturbed (acres)	Percent of site (13,640 ac)	Amount excavated ($\times 10^6$ cubic yards)
Station complex area and coal storage	120	0.9	0.40
Access roads and railroad spur	65	0.5	0.35
Evaporation ponds and dikes	400	2.9	1.10
Ash disposal area	300	2.2	
Ash disposal road	7	0.05	
Well field feeder pipes, access, and electrical service	20	0.02	
Totals	912	6.57	

For the purposes of this environmental analysis, the following terminology is used to describe the areas under discussion.

ES Area (Environmental Statement Area): The entire area under study that would be affected by the proposed power plant and associated transmission lines. This area is shown on the ES Area Map, p. 1-11 .

Project Site Area: Within the ES Area, the 21.3 square mile (13,640 acre) area near Valmy as originally described in the Applicant's Environmental Report. This area is shown on the Plant Site Area Land Status Map and General Layout Map, pp. 1-13 and 1-14 .

Power Plant Complex: The smaller area within the Project Site Area which would actually be developed for the proposed power plant facilities and structures, as shown on Figure 1-2, p. 1-15 .

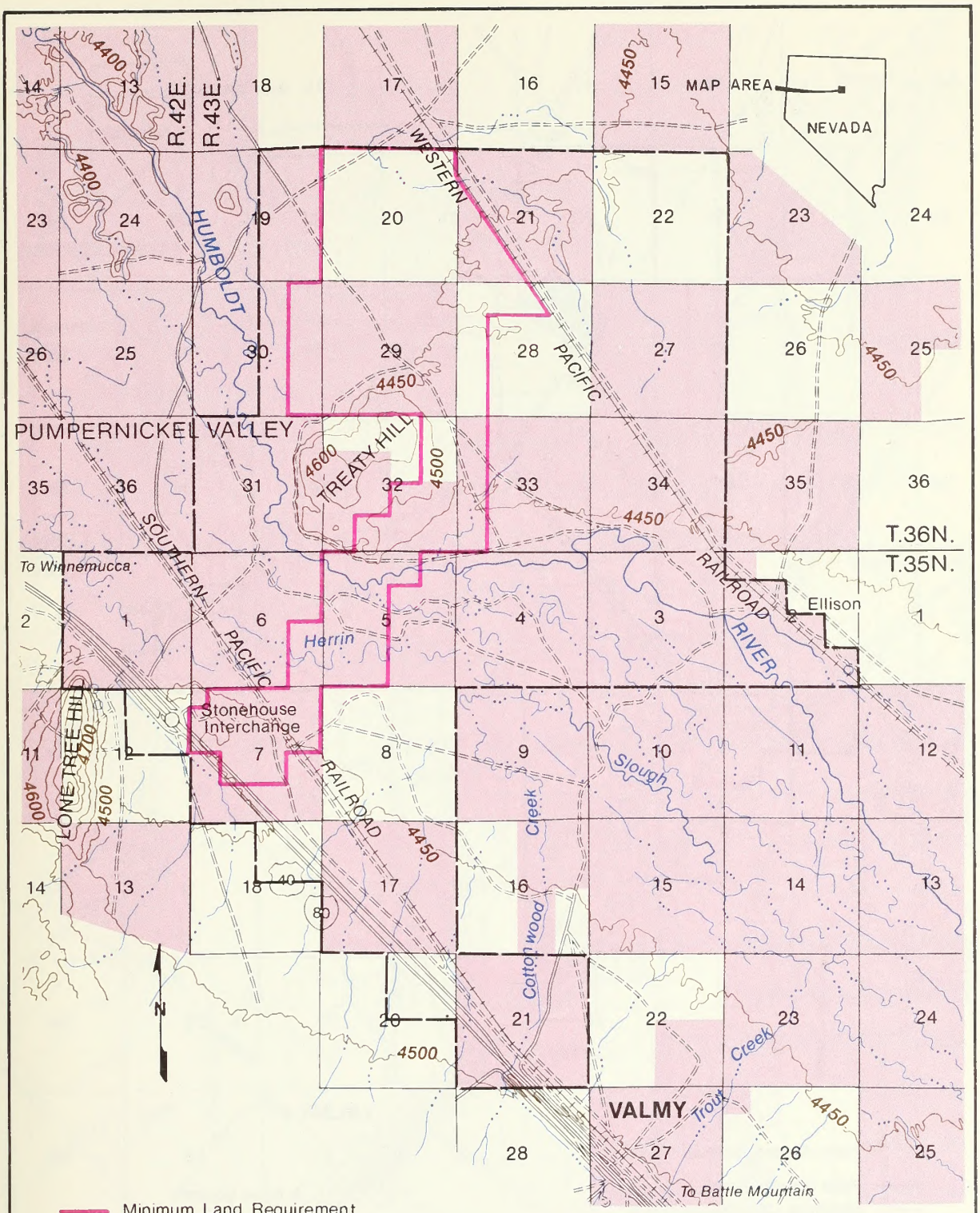
The proposed location for the project was selected by the Applicant as a result of a study conducted by their environmental consultants. This 1975 study is summarized in the Applicant's Environmental Report, and is discussed in Chapter 8 of this statement, p. 8-10 .

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

NORTH VALMY POWER PROJECT

STUDY AREA

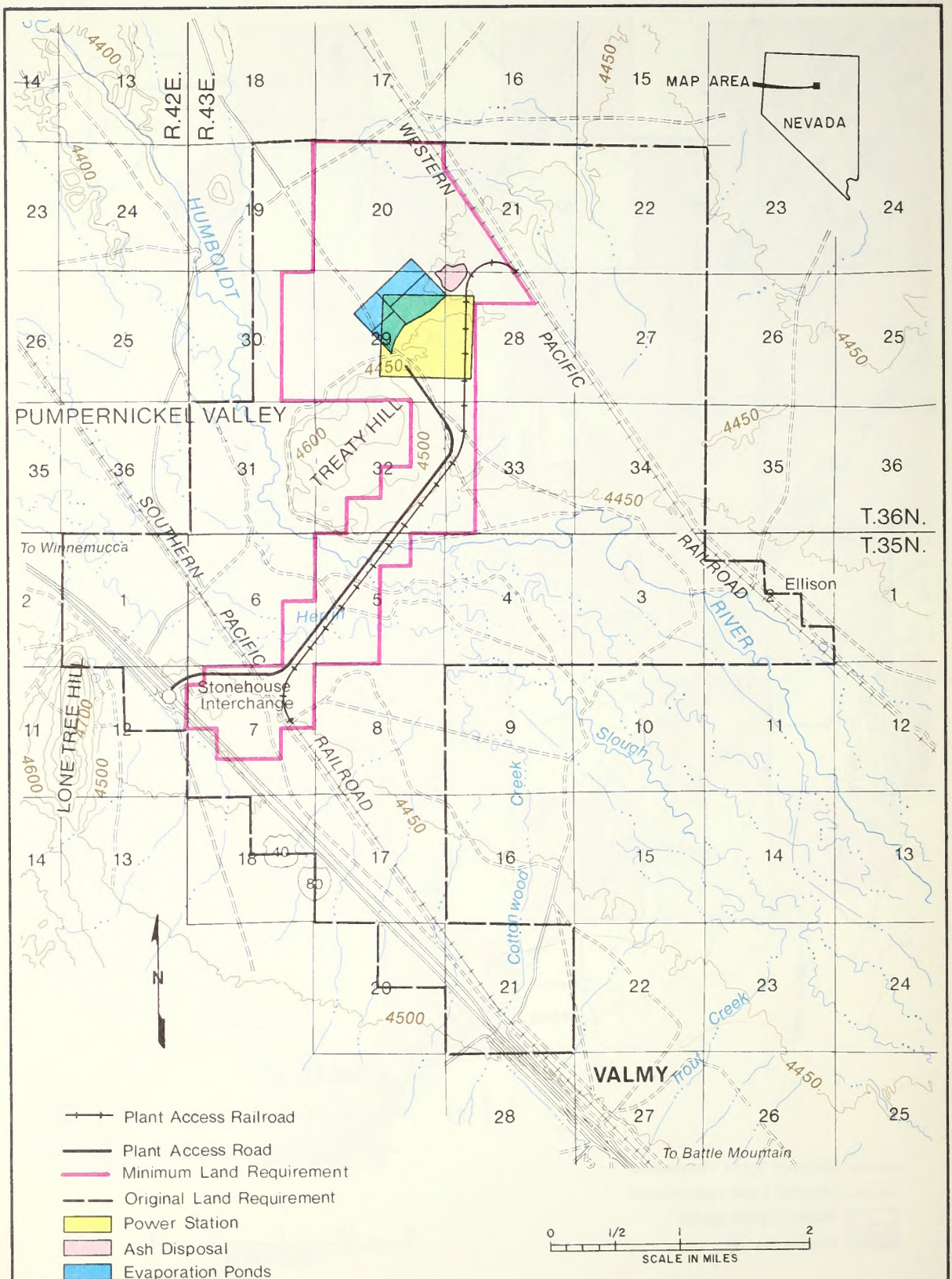
1977



UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

NORTH VALMY POWER PROJECT
LAND STATUS

1977



ADAPTED FROM:
"Environmental Report for the North Valmy Station"
by Westinghouse Electric Corp. for Sierra Pacific Power Company

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

NORTH VALMY POWER PROJECT
GENERAL LAYOUT

1977

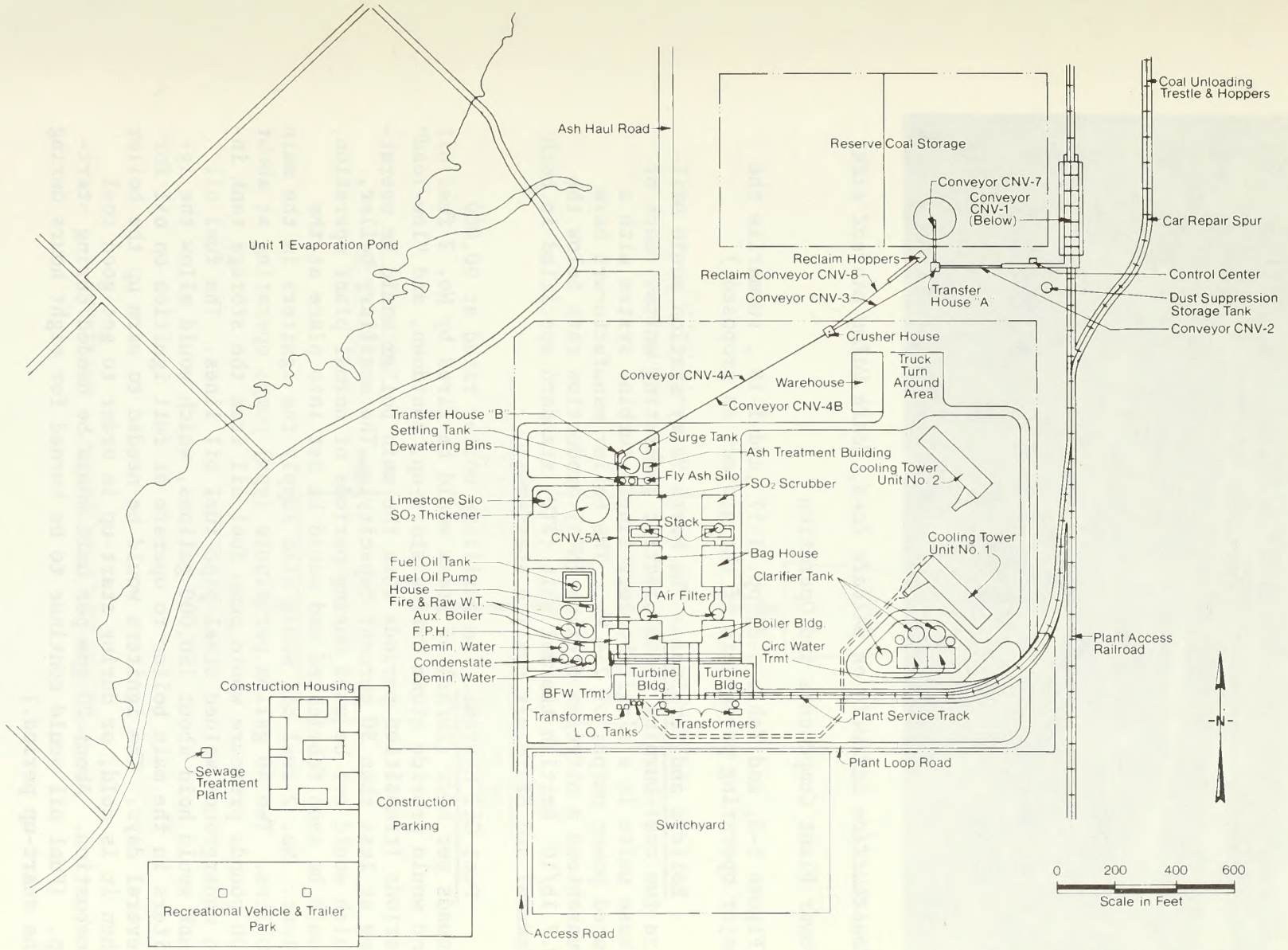


FIGURE 1-2 LAYOUT OF NORTH VALMY STATION

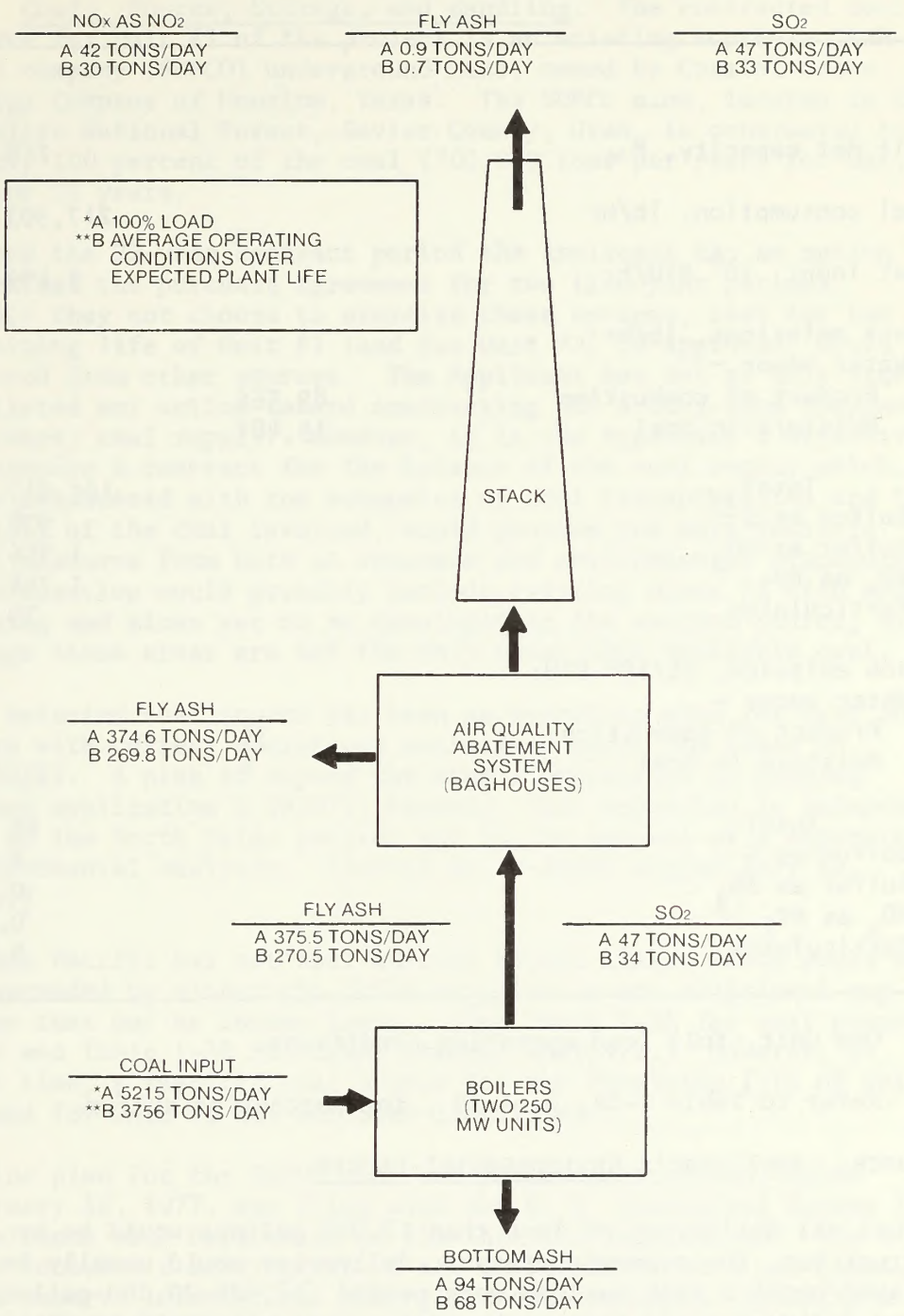
Construction activity on private land, North Valmy project site.

Power Plant Components and Operation

(Figure 1-3, and Table 1-2, pp. 1-17 ,and 1-18 , summarize the major operating parameters of the project as proposed.)

Boilers and Turbines. The North Valmy station would utilize two coal-burning steam-electric generating units. Each of these units is a single-boiler, single-turbine system with a rated power output of 254 Mw. The boiler manufacturers have guaranteed a nitrogen dioxide (NO_2) production rate below the 0.7 lb/10 British thermal unit (BTU) standard specified in both Federal and State air quality standards.

Fuel Oil Systems. An auxiliary boiler rated at 90,000 pounds per hour (lb/hr) of steam would be fired by No. 2 fuel oil and would provide steam during start-up, shutdown, and "low-load" periods (transition periods when the main boiler would be operating at less than 30 percent capacity). The auxiliary boiler, which would not be used during periods of normal plant operation, would be shop fabricated and would be set into place at the plant. No. 2 fuel oil would also supply the igniters in the main boilers. Two 40 gallon per minute (gpm) pumps operating at about 300 pounds pressure would pump fuel oil from the storage tank into underground welded steel pipe fuel oil lines. The fuel oil tank would hold about 150,000 gallons, which would allow the igniters in the main boiler to operate at full ignition on oil for several days. The igniters would be needed to warm up the boiler when it is cold, or during start-up in order to get good coal combustion. About 20 gpm per unit would be needed during start-up. (Fuel oil would continue to be burned for eight hours during the start-up period.)



ADAPTED FROM: "Environmental Report for the North Valmy Station" by Westinghouse Electric Corp. for Sierra Pacific Power Company.

FIGURE 1-3 – EXPECTED MAJOR EMISSIONS – NORTH VALMY STATION

TABLE 1-2
FUEL CONSUMPTION AND STACK EMISSIONS[a/]

Unit net capacity, Mw		250
Fuel consumption, lb/hr		217,303
Heat input, 10^6 BTU/hr		2,499
Stack emissions, lb/hr:		
Water vapor -		
Product of combustion	89,566	
Moisture in coal	15,481	
Total [b/]		105,017
Sulfur as S		978
Sulfur as SO_2		1,956
NO_x as NO_2		1,744
Particulates		39
Stack emission, lb/10^6 BTU:		
Water vapor -		
Product of combustion	36	
Moisture in coal	6	
Total		42
Sulfur as S		0.39
Sulfur as SO_2		0.78
NO_x as NO_2		0.7
Particulates		0.016

a/ One unit, full load operating conditions.

b/ Refer to Table 1-3A, p. 1-20 , for percent of sulfur.

Source: Applicant's Environmental Report.

Fuel oil deliveries of less than 12,000 gallons would be by truck but, for economic reasons, deliveries would usually be delayed until a tank carload were needed (12,000-20,000 gallons), and delivery would then be by rail. Fuel oil would be obtained from commercial sources.

Coal: Source, Storage, and Handling. The contracted coal source for Unit #1 of the project is an existing southern Utah fuel company (SUFCO) underground mine, owned by Coastal State Energy Company of Houston, Texas. The SUFCO mine, located in the Fishlake National Forest, Sevier County, Utah, is contracted to supply 100 percent of the coal (700,000 tons per year) for Unit #1 for 22 years.

Beyond the 22-year contract period the Applicant has an option to extend the purchase agreement for two five-year periods. Should they not choose to exercise these options, coal for the remaining life of Unit #1 (and for Unit #2, if approved) would be secured from other sources. The Applicant has not at this time initiated any action toward contracting for a long-term (beyond 22 years) coal supply. However, it is the Applicant's objective to acquire a contract for the balance of the coal supply which, when considered with the economics of coal transportation and the quality of the coal involved, would provide the most feasible fuel resource from both an economic and environmental standpoint. Consideration would probably include existing mines in Utah and Wyoming and mines yet to be developed in the western states, although these areas are not the only areas with available coal.

The selected coal source has been an operating mine for over 30 years with current operations authorized under BLM Lease No. SL062583. A plan to expand the mine's operations is pending (lease application U-28297); however, this expansion is independent of the North Valmy project and is the subject of a separate environmental analysis. (Serial No. U-28297 signed July 12, 1976.)

Sierra Pacific has set coal quality reject limits which would not be exceeded by either the SUFCO supplier or any additional supplier that may be chosen later. (See Table 1-3A for coal properties and Table 1-3B for trace element analysis.) However, at this time, a specific coal source for the remaining life of Unit #1 and for Unit #2 has not been identified.

A mine plan for the SUFCO mine and proposed extension, dated February 12, 1977, was filed with the U. S. Geological Survey in compliance with Department of the Interior regulations. The mine plan includes a description of the environment, land use plans, coal reserve information, mining method, sequences, production rates, and reclamation procedures.

TABLE 1-3A
SUFCO COAL PROPERTIES, NORTH VALMY STATION

	Typical expected range	Most probable	Worst case (reject quality)
BTU/lb	11,250-11,750	11,500	10,500[a/]
Sulfur, percent	0.35-0.55	0.45	[a/]
Ash, percent	7-11	9.0	13
Moisture, percent	7-10	8.5	12
Lb sulfur/10^6 BTU	--	0.39	0.60[a/]

a/ The combination of sulfur and heat content must not exceed the State of Nevada emission limits or Federal New Source Performance Standards.

Source: Applicant's Environmental Report.

A "high recovery" mining method is being employed, and this method would continue to be used. The property is divided into two zones. The first zone is mined, leaving supportive underground pillars that ensure surface stability. The second zone is mined by a method called "second mining" that removes supportive pillars and allows surface subsidence. The mining procedures must conform to plans which are approved by the Mining Enforcement and Safety Administration (MESA). Site restoration would be a one-time terminal phase, not an on-going reclamation process as in surface mining.

A 90-day reserve of coal (approximately 470,000 tons) sized in two inch and smaller lumps would be stored at the power plant complex in an area of approximately ten acres. The reserve coal storage pile would be compacted by rubber-tired vehicles to condense the surface of the pile and squeeze out as much oxygen as possible to prevent spontaneous combustion and to suppress dust.

Surface runoff from above the coal storage area, which is located in a drainage course, would be diverted around the storage area and returned to its natural drainage pattern downstream from the storage area. Coal storage runoff would be directed to the evaporation ponds.

The coal would be transported from the mine to the power plant complex by unit train operations. Each generating unit would require delivery of coal by a 50- to 55-car train (100 ton capacity

TABLE 1-3B
SUFCO COAL TRACE ELEMENT ANALYSIS

Element	Concentration ppm weight*	Element	Concentration ppm weight*
Uranium	≤ 3	Tellurium	
Thorium	≥ 3	Antimony	≤ 0.2
Bismuth		Tin	0.6
Lead		Cadmium	≤ 0.5
Thallium		Silver	≤ 0.2
Mercury	0.09[a/]	Palladium	
Gold		Rhodium	
Platinum		Ruthenium	
Iridum		Molybdenum	3
Osmium		Nibium	5
Rhenium		Zirconium	80
Tungsten	7[b/]	Yttrium	28
Tantalum		Strontium	85
Hafnium		Rubidium	20
Lutecium		Bromine	0.6
Ytterbium		Selenium	0.9
Thulium		Arsenic	3
Erbium	0.3	Germanium	0.3
Holmium	0.3	Gallium	5
Dysprosium	0.5	Zinc	12[b/]
Terbium	0.3	Copper	11
Gadolinium	0.4	Nickel	12
Europium	0.4	Cobalt	26
Samarium	0.7	Manganese	67
Neodymium	3	Chromium	100
Prsaeodymium	1	Vanadium	50
Cerium	16	Scandium	7
Lanthanum	15	Fluorine	≈120
Barium	50	Boron	44
Cesium	2	Beryllium	0.2
Iodine	0.3	Lithium	4

Alpha	9.5 ± 5.5 pCi/g
Beta	2.61 ± 0.71 pCi/g
Gamma	b/

a/ All elements not reported < 0.2 ppm (parts per million).

b/ Gamma spectrometry identified no Gamma emitting radio nuclides.

Source: Applicant's Environmental Report.

per car) three times per week. With completion of the proposed second unit, two 50-to 55-car trains three times per week would be required.

The power plant complex would be located between the Southern Pacific tracks and the Western Pacific tracks. The unit train would arrive from the Southern Pacific tracks, loop by the complex, and return by way of the Western Pacific tracks.

A bottom dump trestle system about 340 feet long would be used to unload the coal. The reinforced concrete reclaim tunnel would be located below grade at the unloading site. The train would move slowly over the trestle and the coal would be dumped from the bottom of the cars into hoppers under the trestle. Coal delivery would be matched with coal consumption as much as possible, so the coal could be conveyed directly from the unloading hoppers to the power plant. (If it were necessary to take the coal to the reserve pile for storage and later to the plant, the coal would have to be handled twice.) Water for dust suppression would spray the coal as it is dumped at the trestle prior to being conveyed to the plant. If coal were needed from the reserve pile, it would be bulldozed and put on the reclaim hopper to be taken to the coal crusher by covered conveyor and then to Unit #1 or Unit #2. Coal conveyed from the unloading hopper would be crushed to approximately 3/4 of an inch at the coal crusher on the way to the units.

After the coal is crushed, it would be conveyed to silos near the boilers. The four storage silos needed for each of the two units would be fed by two covered conveyors with a coal-carrying capacity of 800 tons per hour. The 57-foot high, 22-foot diameter storage silos would each have an exhaust fan and a bin-type dust collector.

The coal would be fed from each storage silo through feeders to pulverizers where it would be pulverized to 70 percent minus 200 mesh (approximately the consistency of talcum powder) and then transported in a hot air stream to the burner assemblies. The four pulverizers would each have a 45 ton capacity.

Each boiler, containing a multiple arrangement of burners, would burn the coal, producing heat and combustion products. The principal products of burned coal (excluding flue gas) would be bottom ash and fly ash carried through to the baghouse. (See Figure 1-3, p. 1-17 .)

The entire coal handling system has been reviewed by the State of Nevada Division of Environmental Protection Services and has been issued a registration certificate as a potential source of air pollution. As such, the system would be monitored and, if needed, modifications to the system could be required by the State of Nevada.

Water Sources and Use. Water for the project would be pumped from a well being developed near the project site. These wells are

being developed under permits issued by the Nevada State Engineer's Office authorizing a total yield of 8,400 acre-feet per year (5,200 gallons per minute). In addition to these new wells, the Applicant has purchased the water rights of 400.6 acre-feet per year (248 gpm) from an existing well.

Figure 1-4, p. 1-24 , shows the location of the two well fields proposed for the project. (More detailed information on both test and production well locations and water quality is available in the Applicant's Environmental Report, Section 3.5.) Water would be pumped from the well fields to the station through buried 18 inch pipelines. The line for Unit #1 would be approximately 15 miles long and would follow existing rights-of-way to the station complex. The line for Unit #2, while not yet exactly located, would extend from the well field which would be developed approximately 10 miles east of the station.

Power for the well pumps would be available during plant construction from an existing 69/25 kv substation. After construction, power would be provided to the well pumps by 25 kv overhead distribution lines.

Station water use is outlined in Figure 1-5, p. 1-25 . The average make-up water required for each unit is projected to be 2,376 gallons per minute (gpm) with the maximum water requirement being 2,600 gpm during the summer months of June, July, and August. Approximately 97 percent of the station water requirements (2,300 gpm average, and 2,400 gpm maximum) are for cooling tower make-up to replace water lost to evaporation.

Cooling System. After the steam generated in the boilers has passed through the turbine generators it must be cooled and condensed to water. To accomplish the required cooling, water is circulated through a condenser to carry away the waste heat which in turn is dissipated to the atmosphere.

The cooling method proposed for the North Valmy project would consist of a closed-loop circulating water system with an eight-cell mechanical induced-draft cooling tower for each unit. (See Table 1-4, p. 1-26 .) These towers operate by using fans to draw a large volume of air through a falling spray of the heated water returning from the condensers. The falling water droplets would be cooled by evaporation and heat transfer, with the cooled water being collected at the base of the tower where it would again be circulated through the condensers, completing the cycle.

Chemical Storage and Use. The chemicals required for plant operation are primarily for water treatment. The chemicals would be stored at the point of usage. Sulfuric acid and sodium hydroxide would be stored in above-ground tanks. Lime and magnesia would be stored in silos mounted on the roofs of the water treatment buildings. Ferric sulfate and polyelectrolyte would be stored in bags or drums

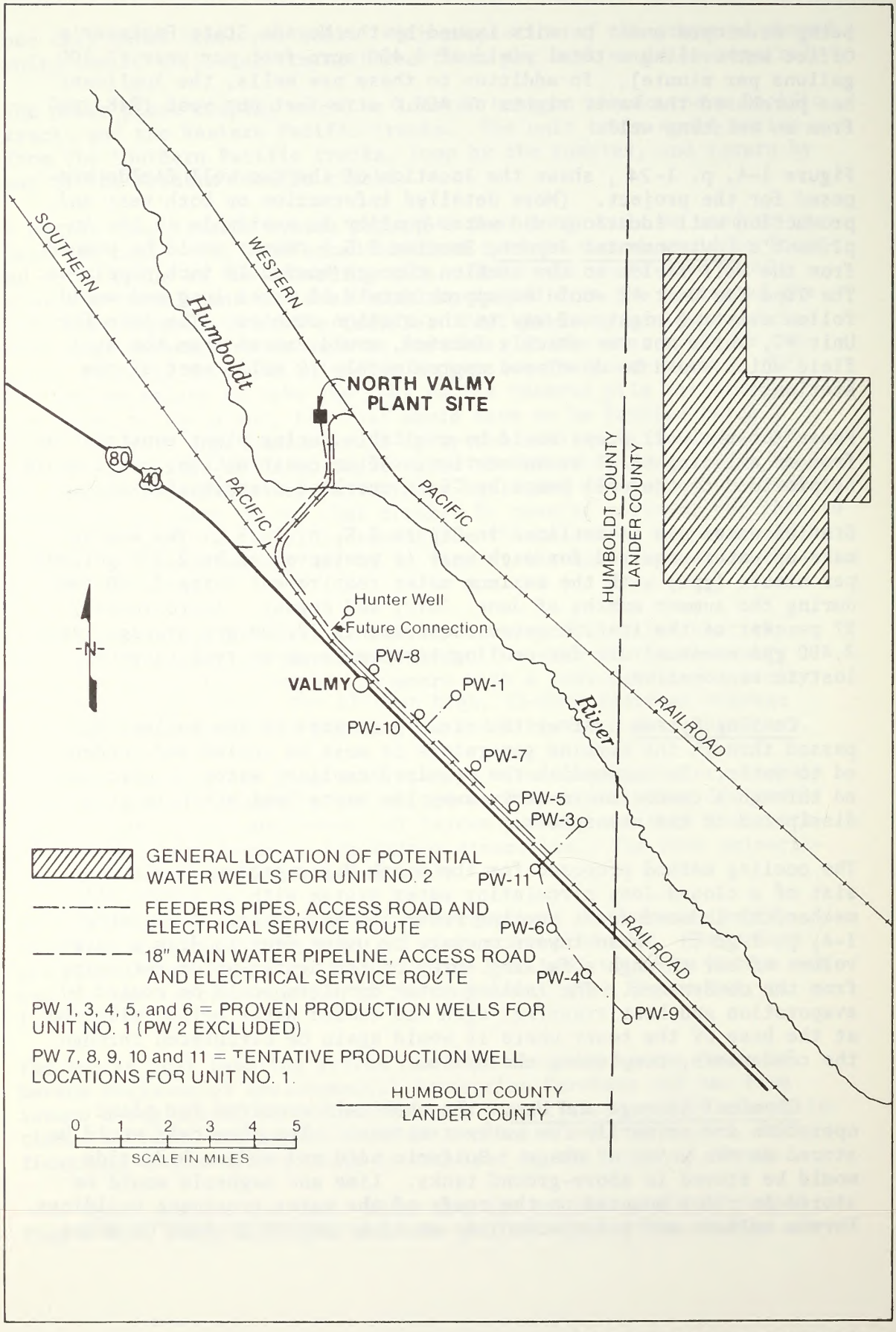


FIGURE 1-4 WELLFIELD AND PIPELINE

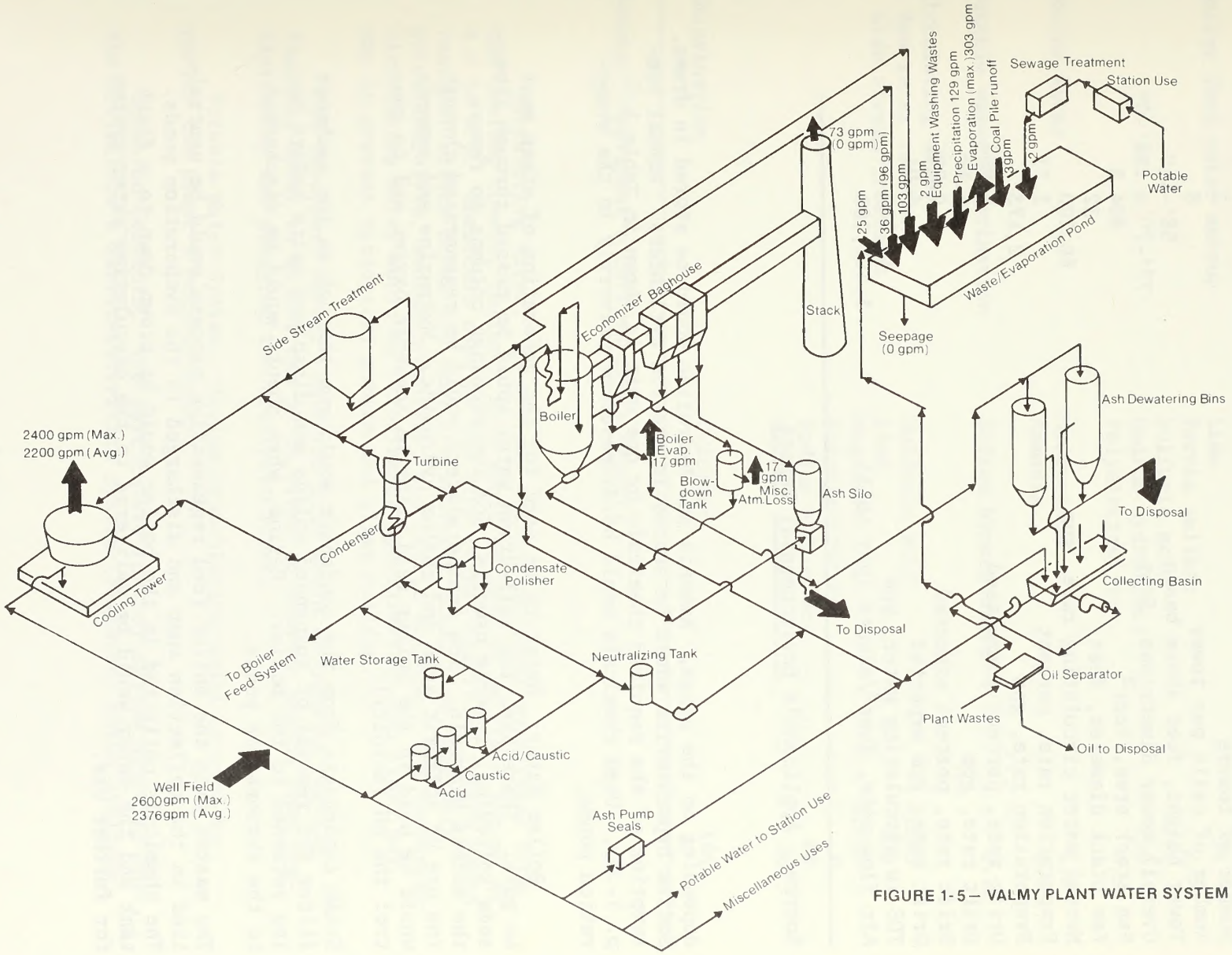


FIGURE 1-5 — VALMY PLANT WATER SYSTEM

TABLE 1-4
COOLING TOWER PARAMETERS

Parameter	Towers 1 & 2
Number of towers	2
Number of cells per tower	8
Tower height, feet above basin	58'-1½"
Overall tower dimensions, feet	77'-7" x 288'-0"
Fan stack area, feet^2	804.3
Fan stack diameter, feet	32
Normal water circulating rate, gpm	80,200
Evaporation rate, percent	2.71
Evaporation rate, gpm	2,173
Drift rate, percent guaranteed	0.008
Drift rate, gpm	6.42
Drift rate, percent expected	0.005
Drift rate, gpm expected	4.01
TDS in circulating water, ppm	10,250
Air flow rate, feet^3/minute (per cell)	1,301,000

Source: Applicant's Environmental Report.

depending on the usage. Ammonia and hydrazine would be stored in drums. Sodium hypochlorite would be stored in one-ton cyclinders. Annual comsumption of the required chemicals by one unit is shown in Table 1-5, p. 1-27 . Used chemicals would be disposed of primarily in the evaporation ponds.

Boiler Water: Water to be used for the generation of steam must be pure. Therefore, the well-drawn water would be passed through lime-soda softening, reverse osmosis, and ion-exchange columns to remove the excess minerals. The demineralizers would be regenerated through the use of sulfuric acid and sodium hydroxide. Hydrazine and ammonia would be used in the boiler feed water to scavenge oxygen and to control the pH (acidity).

Steam condensate from the condenser would run through an ion exchange filter for removal of suspended solids and dissolved salts before being returned to the boiler. Resins, when spent, would be discharged to the evaporation ponds.

The wastes from the boiler feed regenerative process would be neutralized in the collection sump and discharged to the evaporation ponds. The chemicals collected in the boiler would be blown down to a flash tank and the water would be delivered to the circulating water system for further use.

TABLE 1-5
CHEMICALS USAGE-ONE UNIT

Treatment	Chemical	Quantity used (ton/yr)
Boiler feed water makeup	Lime	34
	Ferric sulfate	2.5
	Sulfuric acid	131
	Sodium hydroxide	150
	Polyelectrolyte	0.5
Boiler water	Hydrazine	1.8
	Ammonia	4.4
Potable water chlorination	Sodium hypochlorite	0.25
Circulating water:		
Raw water treatment	Sulfuric acid	2,190
Side stream treatment	Lime	379
	Magnesia	1,035
	Polyelectrolyte	6
	Sodium hydroxide	58
	Ferric sulfate	30
Chlorination	Chlorine	144

Source: Applicant's Environmental Report.

Circulating Water: To prevent scaling as water evaporates from the cooling towers, sulfuric acid would be used to maintain the pH at 8.0 to 9.0. Chemicals used by the side stream clarifier (which keeps residual silica below 150 ppm) are sulfuric acid, lime, magnesia, polyelectrolyte, sodium hydroxide, and ferric sulfate. The condenser circulating water would be chlorinated approximately two times per day to prevent biological growth and slime buildup.

Ash Transport Water: Sulfuric acid would be used in the ash sluicing water to adjust the pH in order to prevent solids from precipitating and plugging the transport lines.

Potable Water System: Sodium hypochlorite would be used to purify the plant's potable water.

Emission Controls. The particulate control system proposed for the project is a fabric-filtration system (baghouse) which utilizes

porous fabric bags housed in a structure separate from the generating plant. When combustion gases pass through the filters, particulate matter is retained by the bag fabric and later removed by a pneumatic cleaning cycle. The proposed baghouse would be compartmentalized, and would contain sufficient numbers of bags to allow for continuous operation during cleaning cycles or when repairs to individual compartments or bags are necessary. The rated efficiency of the proposed baghouse is to be 99.75 percent using the coal identified for use. The collected particulate matter, estimated to average 134.9 tons per day for each unit over the life of the project, would be watered to approximately 15 percent moisture and trucked to the proposed landfill area for disposal.

No other emission control devices are proposed for the project. The Applicant is requesting approval of the project based on predictions that the selected coal, when burned, would produce sulfur dioxide (SO_2) in amount which would fall below established State and Federal standards. (See Chapter 3, Air Quality, p. 3-12 , for standards and calculated emissions.)

Stacks. Each unit would have a 500-foot tall stack constructed of unpainted concrete and equipped with continuously flashing high-intensity strobe lights. Stack design would include sampling platforms for manual and automatic monitoring. Stack parameters are summarized in Table 1-6.

TABLE 1-6
STACK PARAMETERS

Number of stacks	2
Stack height above grade, (ft.)	500
Stack diameter, (ft.)	17.3
Exit temperature, (°F)	280
Efflux velocity, (ft./min.)	4,200

Solid Waste Disposal System. Non-biodegradable solid wastes produced during plant construction and operation would be disposed of in a 300-acre landfill located immediately north of the station. (No permits for the landfill are required by the State or County.) The principal solid waste products produced by the station would be bottom ash and fly ash. A minor portion of the solid waste disposed of in the landfill would be composed of spent chemicals, mill rejects, and small amounts of remodeling and maintenance debris.

Fly ash and bottom ash in a moist condition would be brought in trucks from the station to the landfill area. The active portion of the land-

fill area would be stripped of soil to provide a soil cover when the area is reclaimed. This soil would be piled to the sides of the active disposal area. Ash would be dumped along a working front. Periodically, as the front advances, a soil cover would be placed over the filled areas and new areas opened. The landfill area would be contoured to provide a profile which would blend into the landscape. Details of the reclamation plan may be found in Chapter 4, Mitigating Measures, p. 4-20 .

The landfill would be designed to facilitate solid waste disposal for a period of 10 years in the expectation that a market for the ash would become available in the near future. If additional landfill were required, however, an area north of the Western Pacific Railroad tracks would be developed.

Table 1-7 shows estimated volumes of solid wastes produced.

TABLE 1-7
ESTIMATED VOLUMES OF SOLID WASTES PRODUCED[a/]

Solid waste	Per unit at 100% load (cubic yards/hr)	Over expected life of plant (10^6 cubic yards)[b/]
Bottom ash and mill rejects	1.7	0.8
Fly ash	11.0	5.2

a/ Estimated volumes based on use of assumed coal (Southern Utah Fuel Company coal mine).

b/ Both units averaging 72.03 percent load.

Liquid Waste Disposal System. Two evaporative ponds consisting of two cells each would be developed for storage and evaporation of liquid wastes. The ponds, located northwest of the power plant, would cover a maximum area of 115 acres each and would be 20 feet deep. The ponds would be lined with 30 mil reinforced hypalon on the sides and 20 mil polyvinylchloride (PVC) on the bottom. Liners of this type provide an effective permanent shield against seepage; therefore, the ponds are not considered to be discharge points and are not required to have State permits as such.

The ponds would be of a capacity suitable for evaporating excess water and for storing the remaining residues. Liquid wastes would consist of floor drainage, coal pile runoff, plant sanitary waste, and cooling tower blowdown. The ponds would be fenced with an eight-foot high chain link fence.

Included as a part of the liquid waste disposal system is a 25,000 gpd package treatment plant with treatment consisting of extended biological oxidation and chlorination (one ton per year). This plant would be located on-site and would process all sanitary waste during construction. Effluent from the package plant would be routed to the evaporation ponds for disposal. Prior to completion of the ponds, effluent would be disposed of through use of a leaching pond which has been approved by the Nevada Department of Conservation and Natural Resources.

Fire Protection System. As proposed, the project would include a fire protection system for all components and structures. Water for the fire protection system would be provided from the two 600,000 gallon tanks located at the station complex. This system would be composed of the following types of devices:

- Fifty-foot hose reels located at strategic locations through the plant.

- Portable fire extinguishers located throughout the plant facility.

- Automatic sprinkler systems.

- A carbon dioxide (CO_2) flooding system automatically activated by heat detectors in the cable spreading area and switchgear rooms.

- A water spray system to protect the bearings and oil lines at the main turbine generator, station transformers, and lube oil equipment.

- Smoke detectors for alarm purposes located in the relay and computer room, and the cable spreading and battery rooms.

- A fire pump-house.

Permanent or Operational Work Force. A permanent work force of 60 employees would be required when the power plant complex is fully operational. Table 1-8, p. 1-31 , summarizes the work force required. Construction Work Force is discussed on p. 1-34 .

Power Plant Construction

Power. Power for construction activities at the station complex, well operations, and housing facilities would be provided by a tap on an existing 69/25 kv transmission line which parallels Interstate 80 between Winnemucca and Battle Mountain. The tap would originate from an existing small substation near Valmy, or from a temporary substation facility to be located near the Stone House Interchange on Interstate 80. Providing power to the power plant complex (and the well locations) would involve approximately six miles of line construction, said lines

TABLE 1-8
NORTH VALMY STATION YEARLY OPERATIONAL EMPLOYMENT AND FAMILIES

Year	Operational employment	Local hire	Relocating		
			Employees	Families	Children
1980	30	3	27	23	44
1981	55	6	49	42	80
1982	55	6	49	42	80
1983	55	6	49	42	80
1984	60	6	54	46	87
1985 and beyond	60	6	54	46	87

to follow existing roads and rights-of-way where possible. (See Figure 1-4, p. 1-24 .) Transformers and tie-in equipment would be installed on the site for transferring power to the construction equipment and housing facilities.

Water. Water for construction would originate from an existing well and from the proposed well sites being developed for the project. (See Figure 1-4, p. 1-24 .) The Applicant has estimated that water for construction purposes would not exceed a demand of 200 gpm during construction. Chlorinator facilities would be installed on-site for treatment of domestic water. Waste water would be disposed of through the package treatment plant.

Materials. Construction materials would be obtained by the Applicant from private vendors on a competitive bid basis. Lay down and storage of construction materials would be primarily on-site. Amounts of materials are listed in Table 1-9, p. 1-32 .

Transportation Access. As shown on the General Layout Map, p. 1-14 , the proposed power plant complex would be situated approximately four miles northeast of the Stone House Interchange on Interstate 80, between the existing tracks of the Southern Pacific and Western Pacific Railroads.

To provide access to the complex for both construction and operation, the Applicant has developed a 120-foot wide corridor over private lands to accommodate both vehicular and rail traffic. The corridor would be fenced and equipped with cattleguards.

To accommodate truck and auto traffic, a four-mile long paved road is being constructed in the access corridor. This road would have a 20-foot wide paved surface with four-foot wide unpaved shoulders.

TABLE 1-9
PRIMARY CONSTRUCTION MATERIALS REQUIRED

Plant construction:

6,000 tons structural steel

20,000 cublic yards concrete

11,100 cubic yards aggregate (for roads)

(8,900 cubic yards from private source;
2,200 cubic yards from public source)

Fencing (Eight-foot chain link, with barbed wire canted top):

Station	10,000 linear feet
Evaporative ponds	37,000 linear feet
Total	47,000

A bridging structure consisting of three large diameter arch culverts has been constructed to span the main channel of the Humboldt River.

Bridge spanning main channel of the Humboldt River near the proposed plant complex.

The access road and roadways around the complex, including a parking area near the administration facilities, would be paved with asphalt. Maintenance roads to the evaporative waste ponds and cooling towers, along with all other roads, would be surfaced with gravel.

A railroad spur would be constructed from a turnout on the Southern Pacific Railroad track approximately two miles northwest of Valmy. A single track running north and northwest to the plant complex four miles away would share the earth embankment with the main access road. Switches would be constructed near the plant buildings where the main track runs to the unloading facilities. The track continues past the coal storage area to the Western Pacific Railroad track where an additional switch would be constructed.

Construction Work Force. The Applicant has estimated that construction of the plant and associated facilities would require approximately 450 workers on-site during peak periods. Three sources of workers have been identified for the project. These are: (1) those hired locally (5 percent); (2) those who would commute on a weekly basis form Reno-Sparks or other communities (70 percent); and (3) those who would be recruited out-of-state (25 percent). See Tables 1-10 and 1-11, pp. 1-34 and 1-35 , for further details on the construction work force.

Housing and Other Services. During construction the Applicant would provide on-site facilities as follows:

- Modular bachelor quarters, similar to a motel, to accommodate 200 workers (100 two-man units).

- A camper-recreational vehicle parking area for 125 vehicles with electricity, water, and sewer hook-ups.

- An on-site field kitchen and mess hall to feed 200 workers.

These facilities would be designed primarily for those workers who would commute to the site on a weekly basis from their homes in Reno or elsewhere, and would be removed upon completion of plant construction. (See Figure 1-2, p. 1-15 , for location of these facilities.)

Transmission System

As part of the North Valmy project, the Applicant proposes construction of a 345 kv transmission line to deliver electrical energy from Unit #1 to the Austin substation in Lander County, and a 230 kv transmission line to deliver energy from Unit #2 (should this unit be authorized) to the Mira Loma switching station in southeastern Reno. These proposed transmission lines are shown on the ES Area Map, p. 1-11 .

TABLE 1-10
CONSTRUCTION FORCE COMPOSITION

Craft	Estimated percent labor by craft	Peak employment including subcontractors
Pipefitter	19	76
Electrician	13	51
Laborer	12	46
Carpenter	9	36
Iron worker	10	40
Operating engineer	5	22
Millwright	4	15
Painter	2	8
Teamster	3	12
Cement mason	1	4
Boilermaker	12	56
Insulator	3	12
Sheet metal worker	2	10
Bricklayer	1	4
Miscellaneous	4	8
Subtotal	100	400
Stone & Webster non-manual		35
Subcontractors non-manual		15
Job total		450

Source: Applicant's Environmental Report.

TABLE 1-11
ANNUAL PEAK CONSTRUCTION LABOR AND FAMILIES
(TOTALS BY YEAR)

Year	A Total work force	B Local hire (5% of A)	C Weekly commuters (70% of A)	D Out-of-state relocated (25% of A)	E Relocated with families (20% of A)	F Relocated children (1.8 x E)[a/]
1977	60	3	42	15	12	22
1978	135	7	95	34	27	49
1979	260	13	182	65	52	94
1980	450	23	315	113	90	162
1981	425	21	298	106	85	153
1982	325	16	228	81	65	117
1983	375	19	263	94	75	135
1984	300	15	210	75	60	108
1985	60	3	42	15	12	22

a/ Based on an average family size of 3.8 persons; i.e., two parents plus 1.8 children.

Source: Applicant's Environmental Report.

In addition to the proposed transmission line from Valmy to Austin, the Applicant intends to utilize the existing Tracy to Oreana (Nevada) 345 kv transmission line and the proposed Oreana to Hunt (Idaho) 345 kv transmission line to conduct power from Unit #1 of the proposed North Valmy project. The Tracy-Oreana and Oreana-Hunt transmission lines are segments of Sierra Pacific Power Company's Intertie #2, connecting the Reno, Nevada, area with the Idaho Power Company's system.

The Tracy-Oreana transmission line was analyzed in the Tracy-Oreana Environmental Analysis Record (EAR), completed in December 1975. The Oreana-Hunt transmission line was analyzed in the Oreana-Hunt Final Environmental Statement (INT FES 77-52), filed with the Council on Environmental Quality in July 1977.

With the completion of Unit #1, the proposed power plant would be connected with both major transmission line interties across northern Nevada. This relationship is shown on the Transmission Line Interties Map, p. 1-37 .

	Unit #1 Valmy/Austin 345 kv	Unit #2 Valmy/Mira Loma 230 kv
Right-of-way acqusisition starts	January 1979	January 1982
Construction starts	October 1980	June 1983
Completion date	June 1981	June 1984

Proposed Routing

None of the engineering or surveying work has been completed for either transmission line, so alternative corridors two miles wide along a general routing will be described. Land ownership by corridor segments is shown on Table 1-12, and on the Land Status Map, p. 2-53 .

Valmy-Austin. Four segments are being considered for routing of the Valmy-Austin transmission line, shown as A, B, C, and D on the ES Area Map, p. 1-11 . (The Applicant's preferred route is Segment A and B; the route which generally follows Highway 8A is Segment B and C.) Segment A, 54 miles long, heads southwesterly out of the North Valmy substation, around the west side of Battle Mountain, then southeasterly across the north end of the Fish Creek Mountains, to a point along Highway 8A in the Reese River Valley approximately 38 miles south of the town of Battle Mountain. Segment B, 42 miles long, begins at this point, crosses the Shoshone Range in an area called The Cedars and turns south through Carico Lake Valley, then continues in a southerly direction to the Austin substation, crossing Iowa, Boone, Silver, and Italian Creeks. Segment C, 60 miles long, follows an existing 120 kv line along the north side of Battle Mountain,

SIERRA PACIFIC POWER COMPANY

EXISTING AND PROPOSED TRANSMISSION LINES

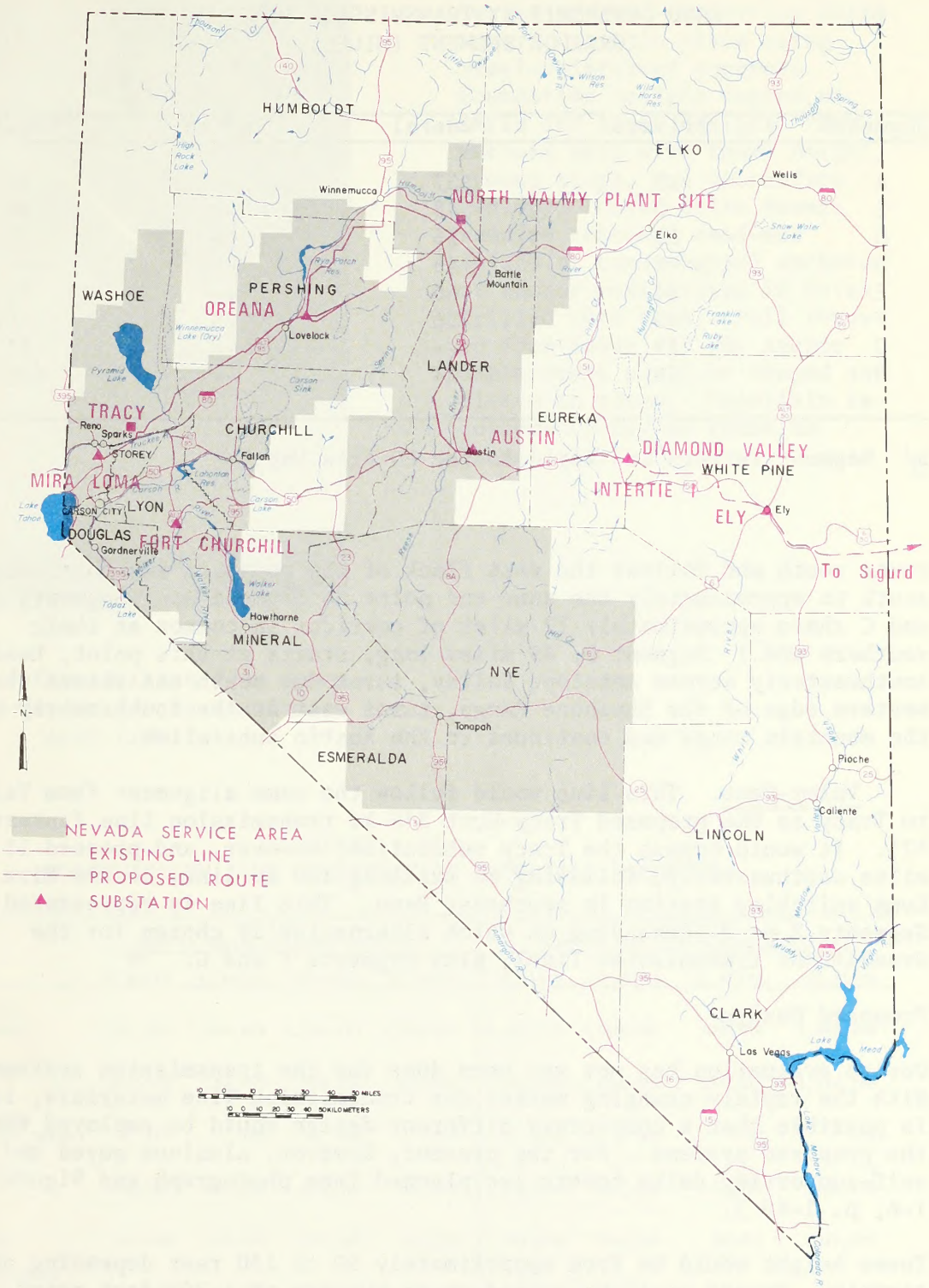


TABLE 1-12
LAND OWNERSHIP BY TRANSMISSION LINE
CORRIDOR SEGMENT (MILES)

Segment[a/]	Private	Federal	Indian	Total
A	13	37	--	50
B	2	43	--	45
C	31	25	--	56
D	6	48	--	54
E	14	60	--	74
F	49	36	5	90
G	11	--	--	11
H	59	44	--	103

a/ Segment letters are keyed to the ES Area Map.

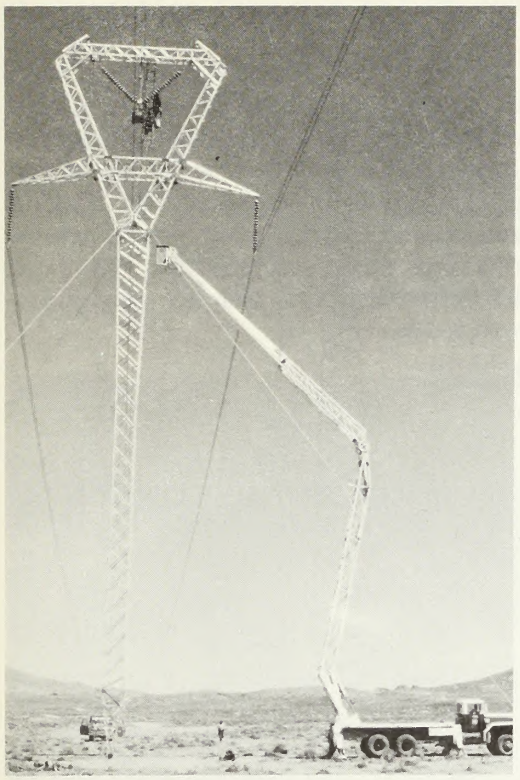
turns south and follows the east flank of the mountain and continues south to approximately the same end point as Segment A. (Segments A and C share approximately 12 miles of corridor in common at their southern end.) Segment D, 49 miles long, starts at this point, heads southwesterly across Antelope Valley, turns due south and skirts the western edge of the Shoshone Range, turns east at the southern tip of the mountain range and continues to the Austin substation.

Valmy-Reno. This line would follow the same alignment from Valmy to Tracy as the proposed Tracy-Hunt 345 kv transmission line (intertie #2). It would bypass the Tracy substation, however, and proceed 11 miles southwesterly, following an existing 120 kv line, to the Mira Loma switching station in southeast Reno. This line is represented by Segments E or H (depending on which alternative is chosen for the Oreana-Hunt transmission line), plus Segments F and G.

Proposed Design

Design evaluation has not yet been done for the transmission systems. With the rapidly changing market for transmission line materials, it is possible that a completely different design could be employed for the proposed systems. For the present, however, aluminum guyed and self-supporting delta towers are planned (see photograph and Figure 1-6, p. 1-40).

Tower height would be from approximately 90 to 130 feet depending on terrain. Towers would be spaced on an average of 1,200 feet apart, varying from 600 to 2,500 feet. Exact height would be governed by safety requirements of the National Electric Safety Code. The code states no conductor can be less than 32 feet from the ground, 34 feet from a roadbed, and 45 feet from a railroad surface. The conductor would be of non-reflective aluminum.



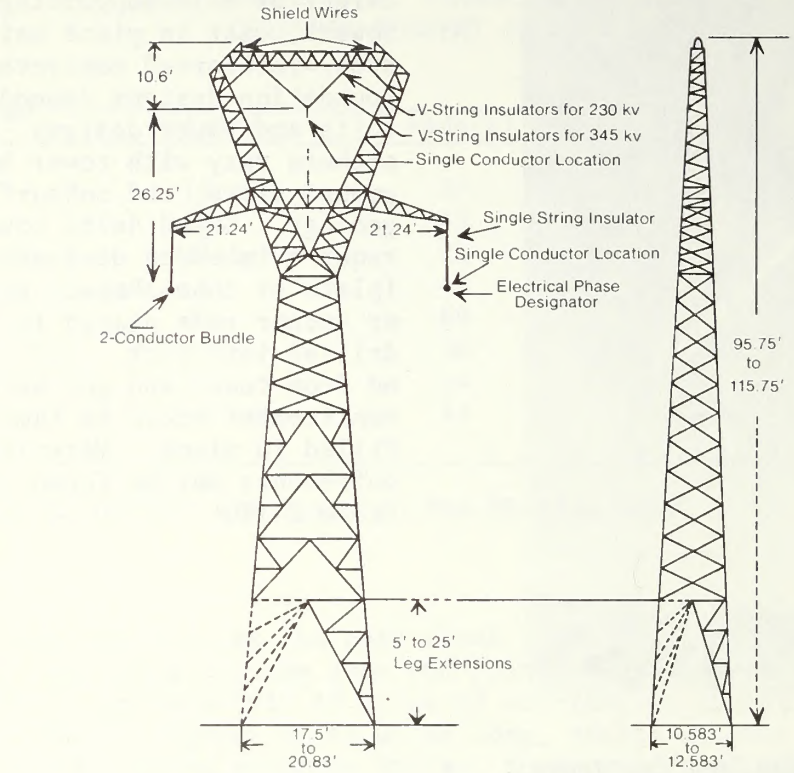
Typical transmission line tower. (Tracy-Oreana 345 kv transmission line.)

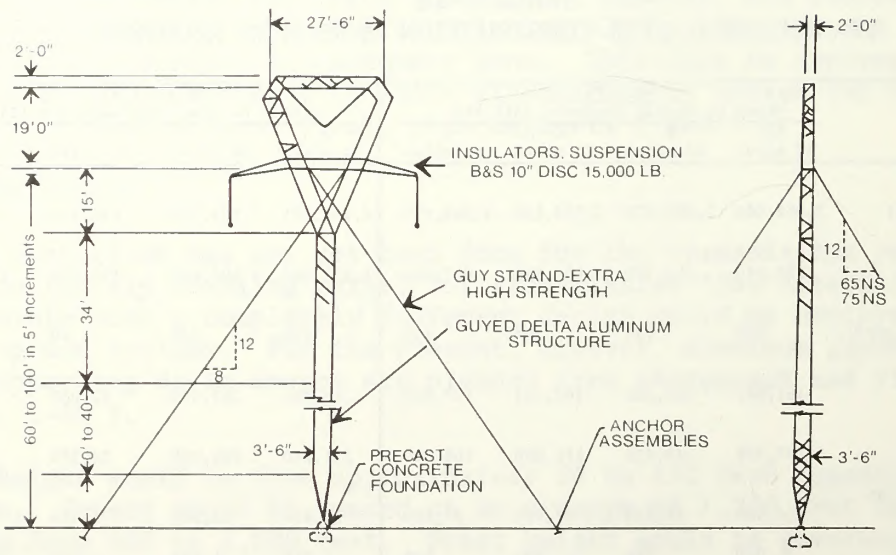
Tower foundations would be precast or, as in the case of larger or self-supporting delta towers, cast in place using steel-reinforced concrete. Foundation designs depend on soils and tower designs. Guy anchors vary with tower height, ground slope, and subsurface geology. Guyed delta towers require imbedded dead-man (plate or cone-shaped) anchors or anchor rods placed in holes drilled into rock. Soil removed from tower and guy anchor emplacement would be tamped and filled in place. Materials requirements may be found in Table 1-13.

TABLE 1-13
TRANSMISSION LINE CONSTRUCTION MATERIALS REQUIRED

	Unit #1 Valmy to Austin segments (345 kv)				Unit #2 Valmy to Mira Loma segments (230 kv)			
	A[a/]	B	C	D	E	F	G	H
Materials	52 miles	45 miles	56 miles	54 miles	74 miles	90 miles	11 miles	103 miles
792 ACSR bundled conductor (pounds)	2,952,069	2,554,675	3,179,151	3,065,610	4,201,021	5,109,350	624,476	5,847,368
Aluminum towers (pounds)	869,440	752,400	936,320	902,880	1,237,280	1,504,800	183,920	1,722,160
Pre-cast concrete footings (cublic yards)	189	164	204	197	270	328	40	376
3/8" steel shield wire (pounds)	151,667	131,250	163,334	157,500	215,834	262,500	32,083	300,417
Alumoweld guy stands (pounds)	162,500	140,625	175,000	168,750	231,250	281,250	34,375	321,875
Porcelain suspension insulaters	16,466	14,250	17,730	17,100	23,434	28,500	3,484	32,618
Anchor rods/cones	920	796	991	956	1,310	1,594	196	1,824

a/ The letters used on this and other tables (A, B, C, etc.) are keyed to the corridor designations on the ES Area Map.





SOURCE: "Environmental Report for the North Valmy Station" by Westinghouse Electric Corp. for Sierra Pacific Power Company.

FIGURE 1-6 – TYPICAL TRANSMISSION LINE TOWERS

Construction Sequence and Procedures

Construction access would be by means of existing roads where possible. Where such roads do not exist, overland travel would be employed. Where the terrain would not allow overland travel, new access roads would be constructed, if authorized by BLM. Access between towers should not require bladed trails except over steep, rough terrain or where heavy brush interferes with safe vehicle operation. Table 1-14, p. 1-42 , summarizes the anticipated surface disturbance from construction of the transmission lines.

Access road constructed by the Sierra Pacific Power Company for the Tracy-Oreana 345 kv transmission line. Similar roads would be required for the North Valmy project.

Tower sites in uneven terrain would require equipment pads in order to safely operate construction equipment. Usually a pad is a cleared area on which a backhoe may prepare footings or anchor sites. Maximum pad size would be approximately 15 to 30 feet. On steep terrain or rough surface up to five pads, plus access to each, may be required.

Equipment driven to the tower site during construction would normally be a small pickup, an air compressor, a backhoe, and a wheel or track-driven auger truck. If tower footings were to be cast in place, three- to five-yard capacity cement trucks would service the tower area. The Applicant has indicated that the work force needed for transmission line construction would be 40 to 80 personnel.

Components used in tower construction would be delivered by a crew using pickup trucks, a medium-sized boom truck, or tracked vehicle, and a 44,000-pound gross weight transport truck and trailer. A

TABLE 1-14
SUMMARY OF LAND REQUIREMENTS AND SURFACE DISTURBANCE (IN ACRES)[a/]

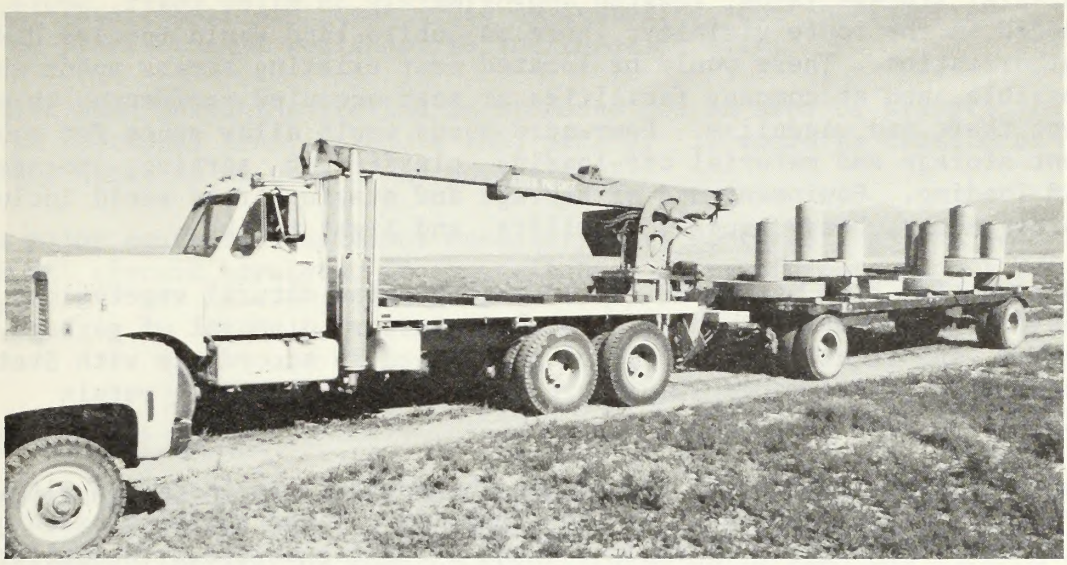
	Unit #1 Valmy to Austin segments (345 kv)				Unit #2 Valmy to Mira Loma segments (230 kv)			
	A[b/]	B	C	D	E	F	G	H
1. Total miles ROW corridor	51	45	56	54	74	90	11	103
2. Miles ROW in rough terrain	3	12	0	10	16	18	10	0
3. Total area within 140-foot with ROW (in acres)	865.0	763.2	949.8	915.8	1,255.8	1,527.3	186.7	1,747.9
4. Construction access (acres):								
a. Between towers	80.6	71.1	88.5	85.3	116.9	142.2	17.4	162.7
b. Outside ROW[c/]	13.8	55.2	--	46.0	73.6	82.8	46.0	--
5. Site construction (acres):								
a. Tower sites	3.4	3.0	3.7	3.6	4.9	5.9	0.7	6.8
b. Tension stations	11.5	10.1	12.6	12.2	16.6	20.2	2.5	23.2
c. Construction pads	0.2	1.0	--	0.8	1.3	1.4	0.8	--
d. Storage yards[d/]	5.8	5.1	6.4	6.2	--	--	1.2	--
e. Helicopter yards[d/]	10.2	9.0	11.2	10.8	--	--	2.2	--
f. Substations								
1. Austin	--	--	--	--	--	--	--	--
2. Mira Loma	--	--	--	--	--	--	1.8	--
Total surface disturbance (in acres)	125.5	154.5	122.4	164.9	213.3	252.5	72.6	192.7

a/ Given or known: (1) 190 foot ROW = 16.96 acres per mile; (2) centerline access trail 13 feet wide = 1.58 acres per mile; (3) towers - 4.4 per mile, average; (4) storage yards (at 35 mile intervals, average) 4 acres each, average; (5) helicopter yards - 10 mile intervals, 2 acres each, average; (6) tension stations - 2 mile intervals, 0.45 acres each, average; (7) tower sites - 0.015 acres each; (8) construction pads - 0.08 acres per mile of rough terrain.

b/ Segments A through H are indicated on the ES Area Map, p. 1-

c/ Based on a factor of 1.9 per mile of ROW in rough terrain.

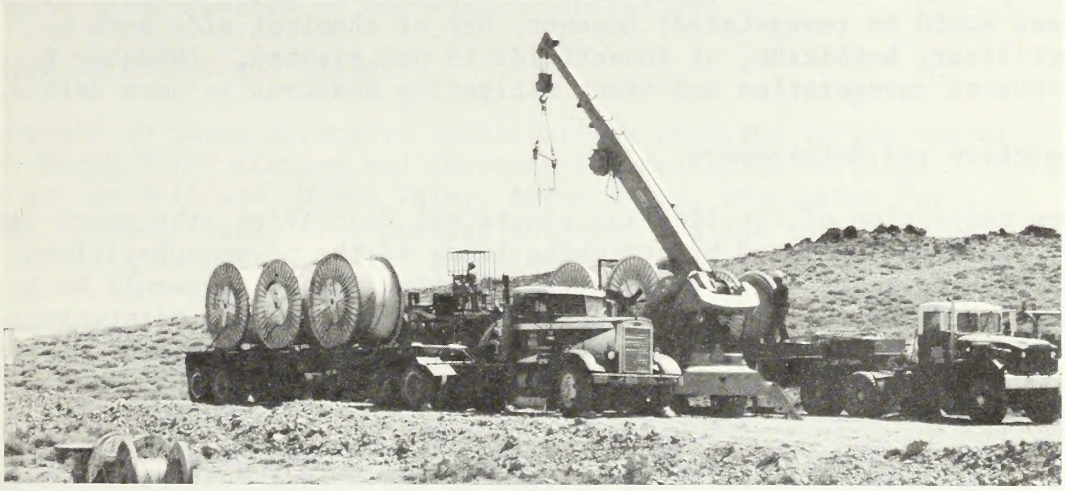
d/ The Valmy-Mira Loma transmission line would use areas previously cleared for a parallel line.



Medium boom truck with tower foundations.

concrete truck would be needed for self-supporting delta towers. Guyed towers would require a compressor, tamper, and a small end loading tractor.

One- to three-acre helicopter staging areas would be located at ten-mile intervals along the route; those on public land would require authorization by BLM. Towers would be assembled and flown to the sites of emplacement from these areas.



Line stringing vehicles used for construction of the Tracy-Oreana 345 kv transmission line.

Material storage yards, located approximately 35 miles apart, would be needed in the route vicinity; those on public land would require BLM authorization. These would be located near existing access roads where possible, and at company facilities or near occupied residences to prevent theft and vandalism. Four-acre yards would allow space for equipment storage and material off-loading, classifying, sorting, storage, and loading. Equipment use of storage and staging areas would include motorgraders, heavy trucks, forklifts, and light trucks.

Construction site materials (including uprooted natural vegetation) would be properly removed, and regular sanitary disposal of garbage, refuse, and liquid waste would be maintained in accordance with State regulations. Flammable liquid areas would be designed to retain liquids in case of spills.

In the final construction stages, the conductors are installed with a tensioner and a puller. The tensioner is a large trailer loaded with two to six reels of conductor and a braking device. The puller is equipped with three permanent reels each containing two to three miles of steel wire rope. The puller works two to three miles ahead of the tensioner, in line with the towers. The conductor-stringing operation usually requires a 10 to 15 man crew, three to five pickups, a medium-sized materials truck, a large truck, and a trailer or large truck for the tensioner. A clipping crew permanently attaches the conductors to the insulators after the aluminum conductors have been installed and pulled to the proper sag and tension.

Cleanup and site restoration would be an ongoing process. Rehabilitation and disposal would be handled one section at a time. All roads, trails, and disturbed areas no longer needed for line operation and maintenance would be obliterated and restored to ground contour whenever possible. In favorable soil with favorable climate, disturbed areas would be revegetated; however, use of chemical aids such as fertilizer, herbicide, or insecticide is not planned. (Chapter 4 discusses revegetation and other mitigating measures in more detail.)

Operation and Maintenance

Upon inspection of the line and electrical facilities, the power system would be energized by attaching leads at the power substations and closing power circuit breakers. Routine inspection would be accomplished from fixed wing aircraft. Normally, routine maintenance repairs are required twice per year for each 100-mile segment of line.

Substations

The North Valmy substation is covered in the Oreana-Hunt Final Environmental Statement (INT FES 77-52). Descriptions of size, location, and equipment for the substation can be found in that Statement, p. 1-11.

The Austin substation is located about three miles north-northeast of Austin. Additional equipment would be installed, but the existing 421- by 515-foot area would not be increased in size.

The Mira Loma switching station is proposed for an area of private land in southeast Reno, T 18N, R 20E, Sec. 3. It would be capable of handling both 120 kv and 230 kv powerlines.

Total major equipment additions necessary for the three stations would be 10 oil circuit breakers, 25 air switches, 6 transformers, and 1 reactor.

Communications System

A communications system would be essential for proper operation of the North Valmy station, the transmission system, and for transmission line safety. The station communication system would send and receive generator control and systems-status monitoring information, incorporating the North Valmy station into the Applicant's power network. Substation communications would be needed to maintain service during system failures, line maintenance, and equipment repair. Automatic operation would be employed to isolate a fault in the system, whereas the manual remote control procedure would be used to de-energize the transmission lines for maintenance.

The communication system would involve existing and new microwave relay stations or a single side-band powerline carrier, supplemented with telephone circuits where available. Microwave relays would be the primary communication between the North Valmy station and Reno while the transmission line carrier would be the primary relay from the North Valmy station to the Austin substation.

Proposed Locations and Design

There would be seven microwave installations utilized in the operation of the North Valmy station and accompanying transmission lines. These sites are as follows: North Valmy, Argenta Rim, Fencemaker Pass, Miriam, Virginia Peak, Reno passive antenna, and the Reno terminal. (See the ES Area Map, p. 1-11 for site locations.) Refer to Table 1-15, p. 1-46 , for site-specific information on each identified microwave facility.

Construction Sequence and Procedures

The North Valmy microwave station would be constructed concurrently with initial plant construction by a crew based in the local communities or in housing provided by the Applicant. The Argenta Rim microwave station would be constructed by a crew based in Battle Mountain, Nevada, while the Fencemaker Pass and Miriam Microwave stations

TABLE 1-15
SITE AND RELATED INFORMATION-
EXISTING AND NEW MICROWAVE SITES

Microwave site name	Site location	Site description, (new, existing, add-on)	New construction and additions					Land holder
			Building	Equipment tower	Reflector	Antennae	Fence	
North Valmy	North Valmy Station	New, located in the substation	Yes	25' high	No	On new tower	Equipment will be located within the substation fence	Sierra
Argenta Rim	W1/2 of the NW1/4 of section 28, T-32N, R-47E MDB&M, Lander County, Nevada	Adjacent to existing equipment	Tentatively, preassembled 16' X 20'	50' high self supporting	No	On new tower	No fence is proposed	BLM
Fencemaker Pass	SW1/4 of the NW1/4 of the projected section 33, T-26N, R-37E MDB&M, Pershing County, Nevada	Adjacent to existing equipment	Tentatively, preassembled 16' X 20'	50' high self supporting	No	On new tower	No fence is proposed	BLM
Miriam	SE1/4 of the SE1/4 of section 29-T25N, R-29E MDB&M, Churchill County, Nevada	Adjacent to existing equipment	Tentatively, preassembled 16' X 20'	25' high self supporting	No	On new tower	No fence is proposed	Southern Pacific Transportation Company
Virginia Peak	NW1/4 of the SW1/4 of section 24, T-22N, R-22E MDB&M, Washoe County, Nevada	Planned for add-on to a site for which Nevada has filed an application	Tentatively, preassembled 16' X 20'	25' high self supporting	No	On new tower	No fence is proposed	BLM
Reno Passive Antenna	SE1/4 of the NW1/4 of section 24, T-19N, R-20E MDB&M, Washoe County, Nevada	New	No	No	16' high by 20' wide, Center 17' above ground	No	No fence is proposed	Curtis Wright Corporation
Reno Terminal	1 Ohm Place Reno, Nevada	Existing	Existing	Existing	No	On existing tower	No fence is necessary	Sierra

Adapted from Applicant's Environmental Report.

would be constructed by a crew based in Lovelock, Nevada. The Virginia Peak microwave station, the Reno passive antenna, and the required facility expansion at the Reno terminal would be constructed by a crew based in Reno.

Site development for the microwave system would require approximately a six month construction time frame, utilizing heavy equipment and five or six crewmen. Site cleanup would be conducted at each site after construction. Access exists to all of the sites except the Reno passive antenna, which is to be installed by helicopter.

2

DESCRIPTION OF THE ENVIRONMENT

2

DESCRIPTION OF THE ENVIRONMENT

EXISTING ENVIRONMENT

INTRODUCTION

The intent of this chapter is to present a description of the resource values which could be impacted should the North Valmy project be implemented. An attempt has been made to limit the descriptions to only the pertinent aspects of the topics discussed and to make the text discussion commensurate with the projected impacts; i.e., if little or no impact to a particular resource has been identified, then only a summary description is provided.

Both regional and site-specific descriptions of the existing environment are included, depending on the nature of the particular resource and the scope of projected impacts. As used in this chapter, the term Environmental Statement Area, or ES Area, defines a roughly triangular area bounded by the two proposed transmission lines with the Valmy project site at the northern apex, as shown on the ES Area Map, p. 1-11 . (The ES Area encompasses the regional descriptions; the site-specific descriptions are included under the subhead "Project Site Area," and refer to the vicinity of the power plant complex as shown on the General Layout Map, p. 1-14..)

Where appropriate, descriptions of the transmission line corridors from Valmy to Mira Loma are summarized or included by reference from the Oreana-Hunt Final Environmental Statement (INT FES 77-52) generally covering the same area.

Topography

Environmental Statement Area

The ES area lies within the Great Basin portion of the Basin and Range physiographic province and has topographic features typical of the province--elongate mountain ranges trending north and south with intervening desert basins. The ranges are 10 to 20 miles wide, 40 to 100 miles long, with elevations of 3,000 to 5,000 feet above the adjacent valleys. The highest peaks are around 10,000 feet above mean sea level (MSL), with the lowest valleys averaging 3,500 feet above MSL. Alluvial fans flank the mountain ranges, and valley floor centers often have playas, since drainage is confined to individual basins or to a series of interconnected basins lacking outlets to the sea. For specific terrain features within the ES area, see the ES Area Map, p. 1-11 .

Project Site Area

The proposed North Valmy project site is situated in the Humboldt River basin of north-central Nevada. The Humboldt River flows west, ultimately discharging into the Humboldt Sink.

The proposed plant complex lies at the 4,455 foot elevation above mean sea level (MSL) on a plateau that was once a floodplain and is now a relict terrace of the Humboldt River. The plant complex, higher than the present floodplain because the base level of the river has lowered, is about 50 feet above the river's surface during average flow. The river's elevation during the 100-year flood stage reaches 4,427 feet MSL. The western edge of the plant complex abuts Treaty Hill, which has a maximum elevation of 4,693 feet above MSL. The remaining portion of the plant complex area is located partially on a floodplain, an alluvial fan, and the plateau, with elevations ranging from 4,408 feet to 4,500 feet above MSL.

Geology

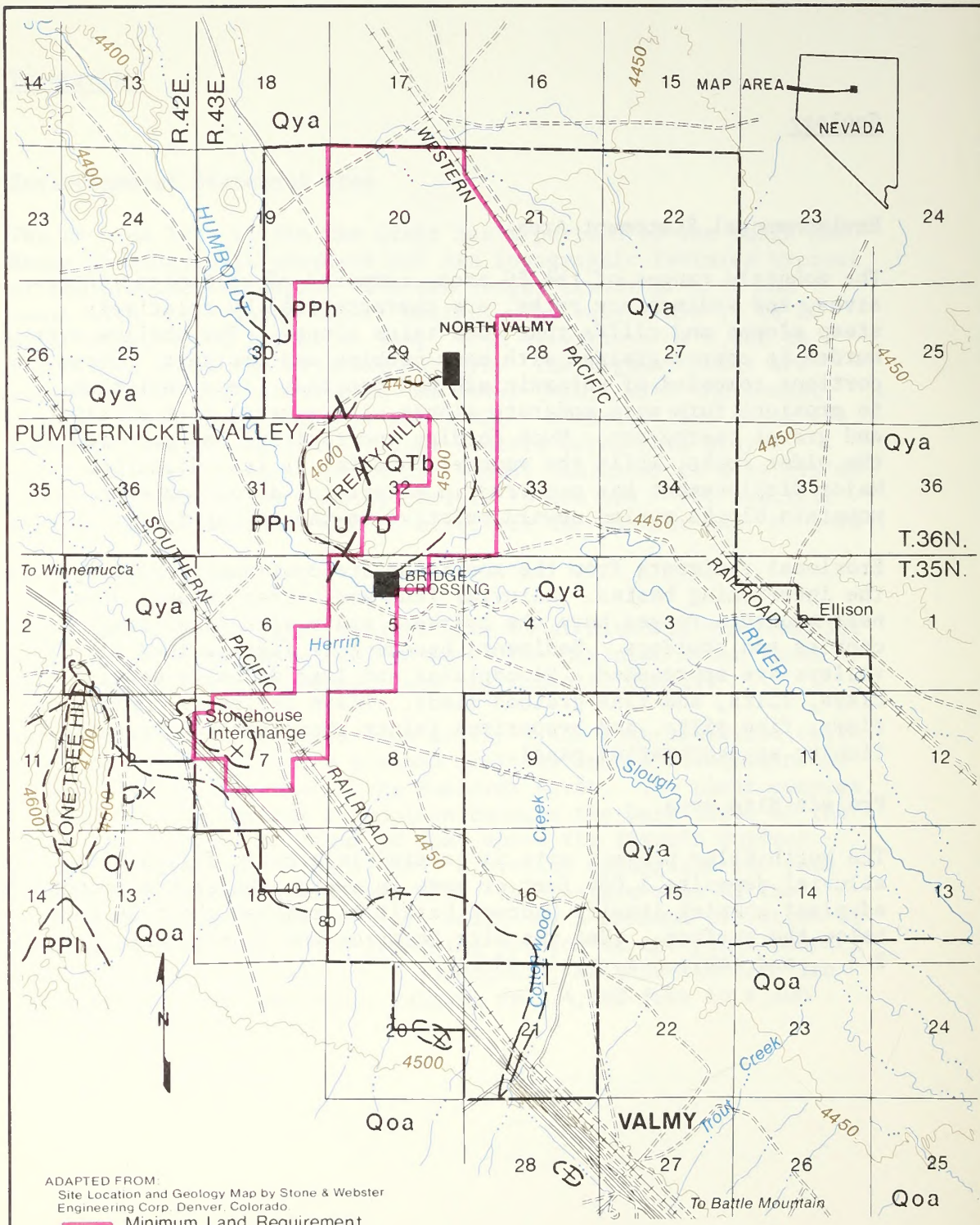
Environmental Statement Area

The mountain ranges of the ES area, composed of volcanics, intrusives, and sedimentary rocks, are characterized by relatively steep slopes and cliffs that form talus slopes. The shallow overburden is coarse-grained with many cobbles and boulders. Those portions composed of volcanic ash and breccias (less resistant to erosion) form more moderate slopes with several feet of sand and gravel overburden. Much folding and faulting has occurred in the older rocks, while the younger material is less disturbed. Major displacement has occurred in a vertical direction with mountain blocks moving upward relative to the valley floors.

Erosional sediments from the mountains are continually filling the intervening basins. Alluvial fans and stream channel deposits near mountain ranges have the coarsest grain size consisting of cobbles and boulders. Sediments become more fine-grained as the valleys are approached. Floodplains and lake deposits consist of clays, silts, and fine-grained sands. Playa sediments consist of clays, fine silts, and evaporites (since these basins are functioning as evaporating pans).

Project Site Area

The North Valmy project site is located in a basin filled with alluvial deposits 1,000 feet or more in depth. Under the proposed plant complex itself, bedrock basalt is reached about 50 feet below the surface. (See the Site Location and Geology Map, p. 2-4 , and Table C-4, p. 10-21 .)



ADAPTED FROM:
Site Location and Geology Map by Stone & Webster Engineering Corp. Denver, Colorado.

Minimum Land Requirement

Original Land Requirement

Qya Younger alluviam — composed of playa, stream, and lake deposits.

Qoa Older alluvium — includes alluvial fan and upland alluvial deposits.

QTb Basalt — vesicular and very fine grained.

PPh Havallah fm. — composed of quartzite & conglomerate.

Ov Valmy fm. — composed of quartzite and chert.

Approximate location of geologic contact.

Fault D=downthrown side; U=upthrown side

Gravel Pits

0 1/2 2
SCALE IN MILES

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

NORTH VALMY POWER PROJECT
SITE LOCATION & GEOLOGY

1977

Seismic Activity

The ES area, including the proposed project site, is located within Seismic Zone 3, denoting possible major earthquake damage. (See the Seismic Risk Map, p. 2-6 . The zones are defined on the key to this map.) Many earthquakes have been recorded in Nevada--one, registering 7.8 on the Richter scale, occurred 30 miles southwest of the project site in 1915. (An earthquake of magnitude 7 or greater can seriously damage dams, embankments, and dikes.) Table 2-1 shows the number of earthquakes that have occurred in the area near the proposed project site.

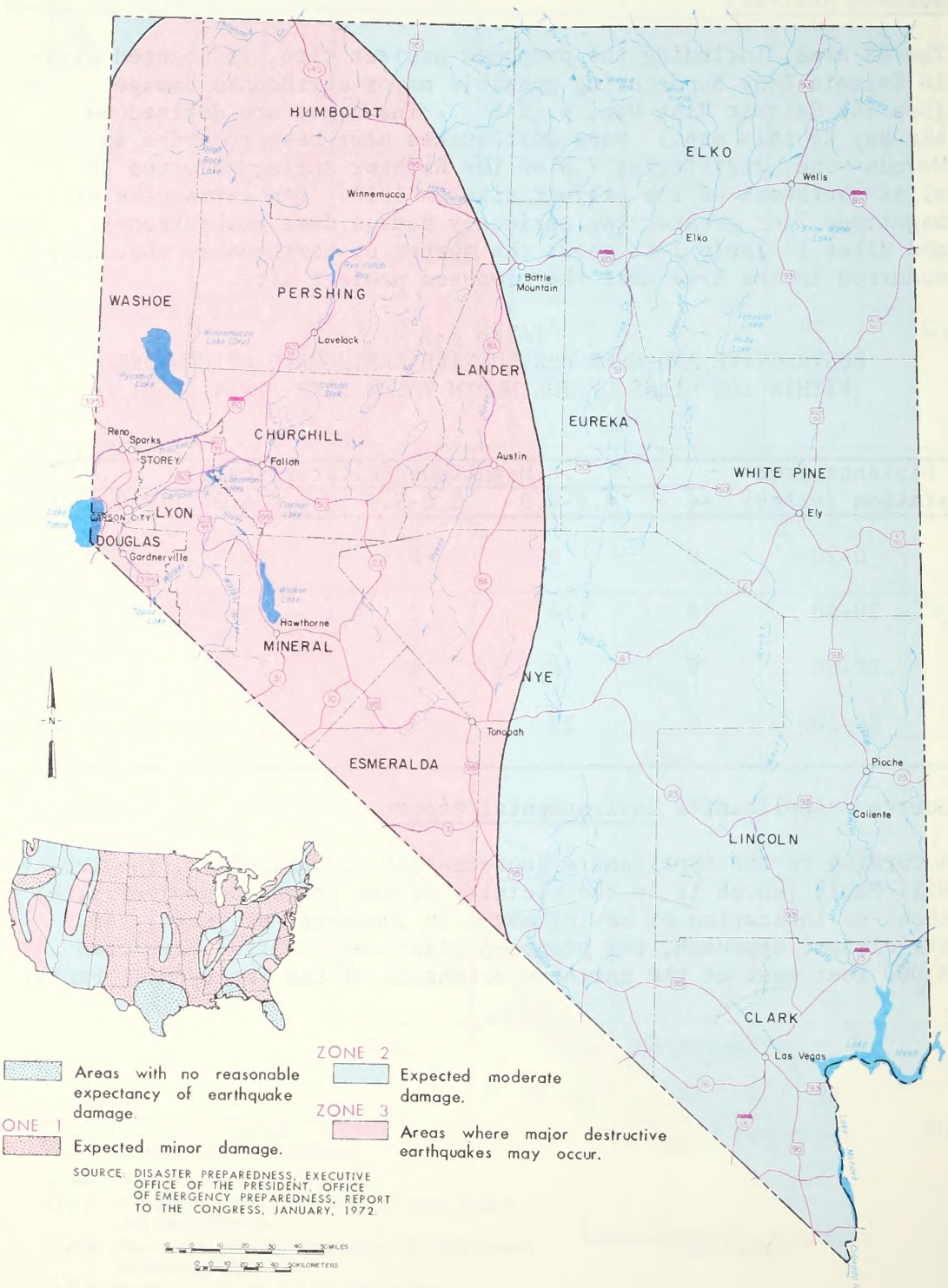
TABLE 2-1
DESTRUCTIVE AND NEAR-DESTRUCTIVE EARTHQUAKE EPICENTERS WITHIN 100 MILES OF THE NORTH VALMY SITE (1854-1960)

Distance from station (miles)	Magnitude (Richter scale)					
	<4	4.0-4.9	5.0-5.9	6.0-6.9	>7.0	Total
0-20	0	0	0	0	0	0
20-50	0	14	2	1	1	18
50-80	0	14	4	3	0	21
80-100	0	23	3	2	0	28

Source: Applicant's Environmental Report.

According to the Applicant's geotechnical investigation, the Treaty Hill Fault (which is in the vicinity of the proposed project site) shows no indication of having moved in thousands of years. At its closest approach, the proposed plant complex lies more than 3,000 feet east of the northern extension of the Treaty Hill Fault.

SEISMIC RISK



Soils

The soil resource is basic to all biological life within the ES area. Soil formation is a product of the interaction of climate, parent material, topography, and living organisms. Soil physically supports vegetation, regenerates itself by interaction with the total environment, and is the basic component of each watershed, conducting and/or retaining natural rainfall.

The soils of the ES area are composed of four basic soil orders--Aridisols, Mollisols, Entisols, and Vertisols--with one unclassified group found in playas and rock outcrops. (See the Soils Map, p. 2-9 . For detailed soils analyses of the plant site, refer to Stone and Webster Engineering Company's Geotechnical Investigation.)

The major vegetation of the project site (shadscale, greasewood, and saltgrass) indicates that the soils in most of this area are quite saline (in excess of 10,000 ppm total dissolved solids). The leaching studies described in the Applicant's Environmental Report confirm this, indicating leachate solutions in the range of 35,000 ppm.

Appendix C, p. 10-1 , contains soil taxonomy information, the 1938 Soil Classification (as revised to 1959) with approximate equivalents in the present system, and phases of family subgroups (with interpretations) occurring within the ES area. A brief discussion of each soil order within the ES area is included here.

Aridisols

Soils of this order are usually dry and low in organic matter content. Slopes and land surfaces vary widely. Without supplemental irrigation the potential for revegetation within this soil order is generally low, primarily due to the occurrence of Aridisols in areas of low precipitation. Successful revegetation is usually limited to native plant species. Natural revegetation success is highly variable, being dependent primarily on soil compaction and available seed sources. Aridisols have low organic matter content, which would also hinder revegetative processes.

Entisols

Soils in this category occupy geologically recent land surfaces and show little evidence of physical or chemical alteration. Revegetation potential within this soil order is low in areas receiving less than eight inches of precipitation annually, fair where precipitation ranges between eight and twelve inches an-

nually, and good in areas receiving greater than twelve inches annually. (Revegetation potential within this order is further dependent on other factors such as depth to water table, soil drainage, slope factors, salt content, soil compaction, soil water-holding capacity, and the stoniness of the soil surface.)

Vertisols

Soils of this order occupy depressions and some geologically old land surfaces. They usually contain more than 40 percent high shrink-swell clays. If coarse fragments are present, they are mostly on the surface. When dry, cracks up to four inches wide may occur on the surface of these soils. Revegetation potential within soils of this order is generally poor, primarily due to the high shrink-well characteristics of this soil order.

Mollisols

These dark colored soils occupy the poorly drained areas and higher precipitation zones and contain high amounts of surface soil organic matter. The revegetation potential of these soils is higher than in the other three soil orders because the high surface organic matter content supplies essential nutrients. However, limitations discussed under Aridisols and Entisols would also apply to Mollisols.

Soil samples taken from the project site were analyzed by the applicant's environmental consultants. Results of this study are summarized in Appendix 7.4.A of the Applicant's Environmental Report. Table C-3, p. 10-20 , shows trace element concentrations for selected soils. Figure C-1, p. 10-22 , shows the relationship between soil pH and the availability of nutrients for microorganisms and higher plants. Soil pH in the vicinity of the project site (which generally varies between 7 and 9) is such that the availability of many trace elements is low.

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

NORTH VALMY POWER PROJECT

SOILS GROUPS

1977

Climate

General Climatology

The continental steppe climate of the ES area ranges from subhumid in the higher mountainous terrain to semiarid in the valleys. The ES area is located between the Sierra Nevada and Rocky Mountain ranges, and the area's climate is affected by both of these mountain systems. Pacific storms lose much of their moisture when passing east over the Sierras, and the Rocky Mountains prevent long periods of extremely cold temperatures by forcing many southward-moving arctic air masses to swerve east into the Great Plains.

The general climatology of the North Valmy site is adequately described by meteorological data from the National Weather Service station at Winnemucca, Nevada. This station is about 36 miles from the proposed project site, and is located in similar terrain at an elevation of 4,301 feet.

The Applicant's environmental consultants built a 100 meter tower approximately six miles south-southeast of the proposed plant complex to measure wind speed, direction, and air temperatures at the 10 meter and 100 meter levels. This tower has been operational since July 1975.

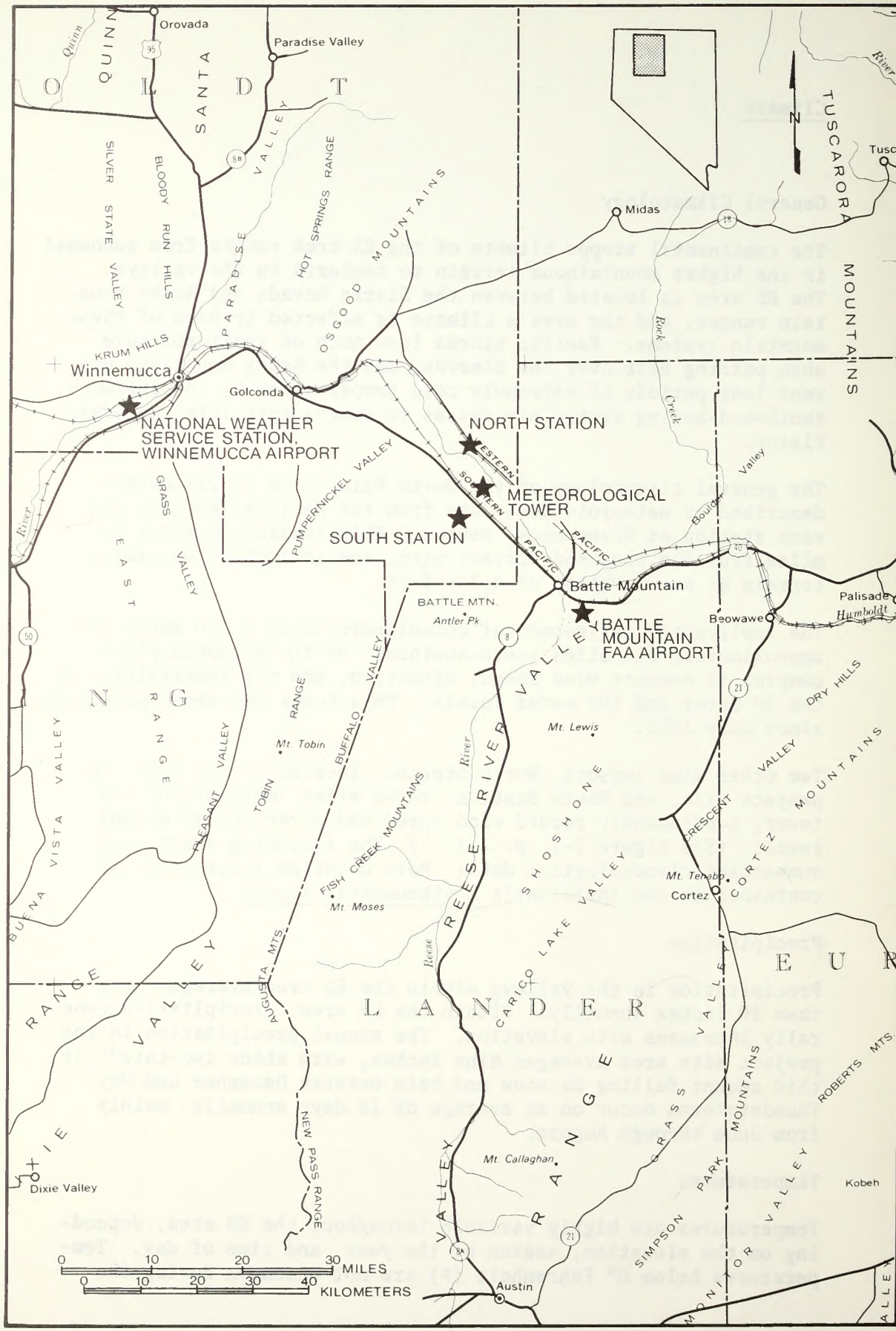
Two other wind sensors, North Station, located on the proposed project site, and South Station, three miles southwest of the tower, continuously record wind speed and direction at ground level. (See Figure 2-1, p. 2-12 .) The following discussion summarizes climatological data. More detailed information is contained in the Applicant's Environmental Report.

Precipitation

Precipitation in the valleys within the ES area averages less than 10 inches annually. Within the ES area, precipitation generally increases with elevation. The annual precipitation in the project site area averages nine inches, with about two-thirds of this amount falling as snow and rain between December and May. Thunderstorms occur on an average of 15 days annually, mainly from June through August.

Temperatures

Temperatures are highly variable throughout the ES area, depending on the elevation, season of the year, and time of day. Temperatures below 0° Fahrenheit (F) are not uncommon during the



LOCATIONS OF CLIMATOLOGICAL STATIONS AND METEOROLOGICAL INSTRUMENTS

ADAPTED FROM:

"Environmental Report for the North Valmy Station" by Westinghouse Electric Corp. for Sierra Pacific Power Company

FIGURE 2-1

long winters. Temperatures at or below 32° F occur on an average of 188 days annually (174 of which occur between October and April). Temperatures rise considerably after sunrise, remain relatively high during daylight hours, then drop quickly after sundown. Daily temperature fluctuations of 50° F can occur. See Table 2-2 for record and average temperatures in Winnemucca.

TABLE 2-2
RECORD AND AVERAGE TEMPERATURES

Temperature	Winnemucca (° F)
Record high	108.0
Record low	- 36.0
Annual mean	47.9
Average daily high	64.3
Average daily low	31.4

Source: National Oceanic and Atmospheric Administration data summarized in Applicant's Environmental Report.

Temperatures in the project site area have ranged from a January low of -36° F to a July high of 108° F. Temperatures of 100° F or higher occur on an average of two days annually. Temperatures of 32° F or lower occur on an average of 194 days annually at the project site, of which eight days have temperatures of 0° F or lower.

Winds

The prevailing direction of surface winds in the ES area is from the west. Dust and sandstorms sometimes occur, primarily in the spring. Winnemucca's hourly wind speeds average 7.9 mph annually. Fastest wind speeds (30 feet above the ground) at the project site are shown on Table 2-3, p. 2-14.

TABLE 2-3
FASTEST WIND SPEEDS

Recurrence interval (years)	Fastest-mile speed (mph)
2	52
10	64
25	72
50	80
100	83

Adapted from Applicant's Environmental Report.

Wind roses for all months combined, measured at two levels of the meteorological tower at Valmy, and annual wind roses for morning and afternoon (with wind speed data) are shown in Figure 2-2, p. 2-15 . Percentage frequency of wind direction during stable conditions is shown in Table 2-4, p. 2-16 .

Humidity and Fog

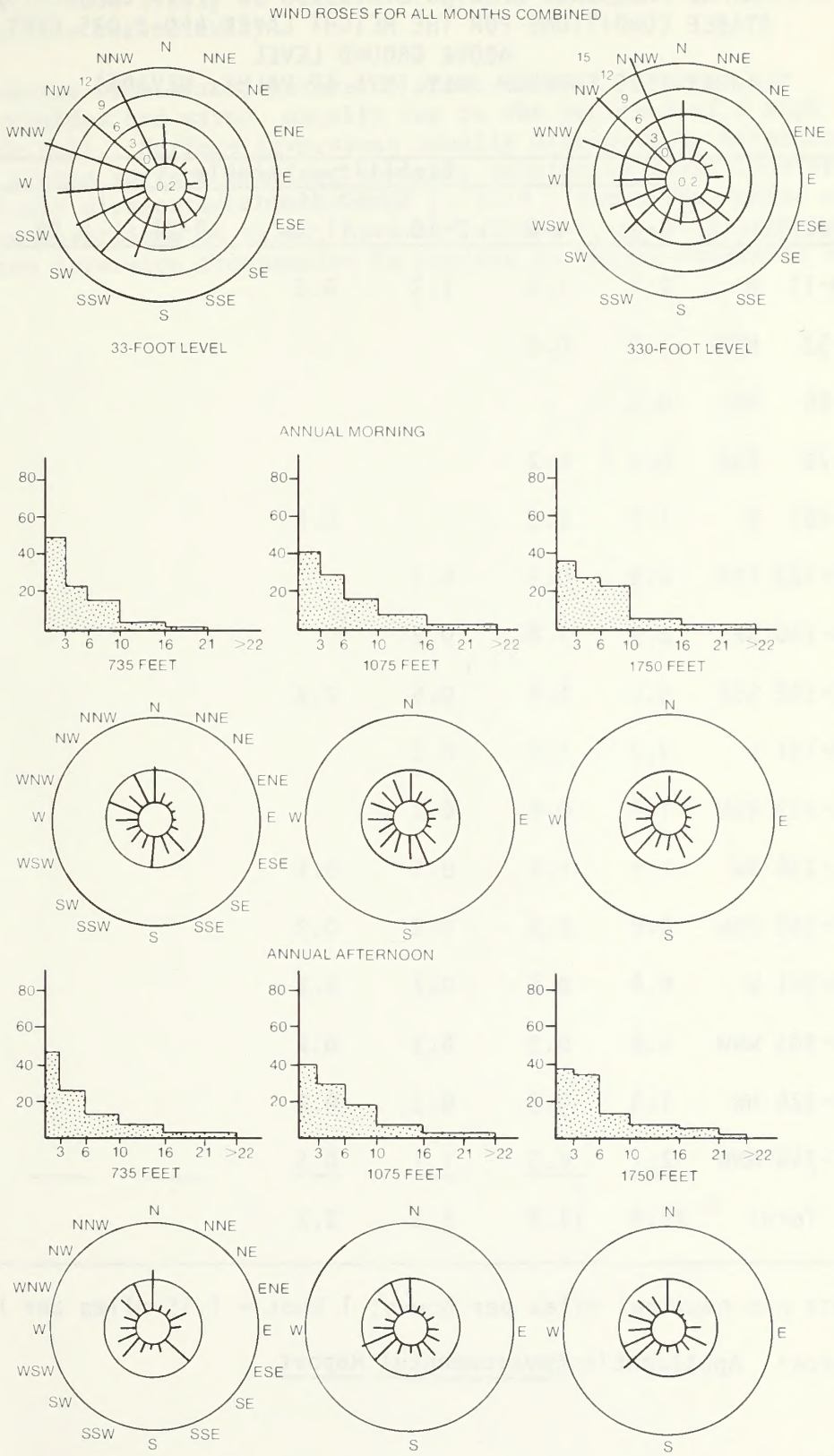
Relative humidity in the ES area is highest in December and steadily decreases until late July. It increases from August until December. Average relative humidity is 49 percent at Winnemucca. Relative humidity is highest in the morning and lowest in the afternoon. Heavy fog (one-quarter mile or less visibility) occurs on an average of four days annually in the project site area. This low frequency is due to northern Nevada's low humidity.

Extreme Weather

Glaze storms and tornadoes are rare in Nevada. No glaze storms were recorded from 1925 to 1953, and only three tornadoes have been recorded in or near the ES area between 1959 and 1973.

Inversions

Inversions of two types occur within the ES area: Radiation inversions (also called surface or nocturnal inversions), and subsidence (or elevated) inversions. A radiation inversion occurs when air, cooled at night by contact with cooler radiating surfaces, deepens as the night progresses and forms a surface layer



SOURCE: Environmental Report for the North Valmy Station by Westinghouse Electric Corp. for Sierra Pacific Power Company

FIGURE 2-2 — WIND ROSES VALMY, NEVADA

TABLE 2-4
PERCENTAGE FREQUENCY OF WIND DIRECTION IN SPEED CLASSES DURING STABLE CONDITIONS FOR THE HEIGHT LAYER 440-2,035 FEET ABOVE GROUND LEVEL
(JULY 1975 THROUGH JULY 1976 AT VALMY, NEVADA)

		Stability: stable						
		Speed (knots)						
Direction		0-3	4-6	7-10	11-16	17-21	> 22	Total
349-11	N	2.1	1.6	1.3	0.2			5.2
12-33	NNE	1.0	0.3					1.3
34-56	NE	0.6						0.6
57-78	ENE	0.6	0.2					0.8
79-101	E	1.1	0.5		0.2			1.8
102-123	ESE	2.9	0.5	0.2				3.5
124-146	SE	2.7	1.8	0.2				4.7
147-168	SSE	3.0	1.6	0.6	0.2			5.5
169-191	S	3.7	1.0	0.2				4.8
192-213	SSW	1.6	0.8	0.2				2.6
214-236	SW	1.1	1.4	0.5	0.6			3.7
237-258	WSW	0.8	0.3	0.2	0.2			1.4
259-281	W	0.8	0.6	0.2	0.2			1.8
282-303	WNW	0.6	0.3	0.3	0.2			1.4
304-326	NW	1.4	0.5	0.3	0.2			2.4
327-348	NNW	2.1	0.3	1.1	0.5			4.0
Total		26.4	11.8	5.2	2.2			45.6

Knots are nautical miles per hours; 1 knot = 1.15 miles per hour.

Source: Applicant's Environmental Report.

in which the temperature increases with height. This type of inversion is more likely to occur over ground that has relatively high surface reflectivity.

A subsidence or elevated inversion occurs when a layer of air aloft subsides and warms, usually due to the presence of a high pressure cell. Surface inversions usually dissipate by afternoon due to ground surface heating; however, subsidence inversions are not quickly dissipated. Table 2-5, p. 2-18 , shows the number of elevated inversions at Valmy, Nevada; Table 2-6, p. 2-19 , shows radiation inversion frequencies in percent by height intervals at Valmy.

TABLE 2-5
NUMBER OF ELEVATED INVERSIONS (MEASURED AT THE TOP) BY HEIGHT INTERVALS
FOR MORNING AND AFTERNOON DURING 1975-1976 AT VALMY, NEVADA

Height of inversion tops (feet above ground)	Summer		Fall		Winter		Spring	
	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon
0- 300						1		
300-1,000						2		
1,000-1,600			2		3	4		
1,600-2,300			2	3	4	5	1	
2,300-3,300			3	2	2	1	1	1
3,300-4,900			6	2		2	2	1
>4,900								
Number of inversions aloft	0	0	13	7	9	15	4	2
Number of aircraft soundings	29	23	27	20	25	21	29	23

Source: Applicant's Environmental Report.

TABLE 2-6
FREQUENCIES OF RADIATION INVERSIONS (MEASURED AT THE TOP) BY HEIGHT INTERVALS FOR MORNING AND AFTERNOON DURING 1975-1976 AT VALMY, NEVADA

Height of inversion tops (feet above ground)	Summer		Fall		Winter		Spring	
	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon
	(percent)		(percent)		(percent)		(percent)	
0- 300	7		4		4		7	
300-1,000	55		30		44		55	
1,000-1,600	28		48	4	20		14	
1,600-2,300			7		8		7	
2,300-3,300					8			
3,300-4,900								
>4,900								
Frequency of inversions	90	0	89	4	84	0	83	0
No inversion	10	100	11	96	16	100	17	100
Number of aircraft soundings	29	23	27	20	25	21	29	23

Source: Applicant's Environmental Report.

Air Quality

Air quality is a product of pollution sources and the ability of the surrounding air to disperse these pollutants. Dispersion potential is further influenced by such variables as winds, temperatures, and atmospheric stability as previously described in the climate section.

Under the provisions of the "Prevention of Significant Deterioration of Air Quality" regulations, all of Nevada (with the exception of the Class I Jarbidge Wilderness Area in northern Elko County) is classified as a Class II area. This classification applies to areas in which air quality deterioration normally accompanying moderate, well controlled growth would be considered insignificant.

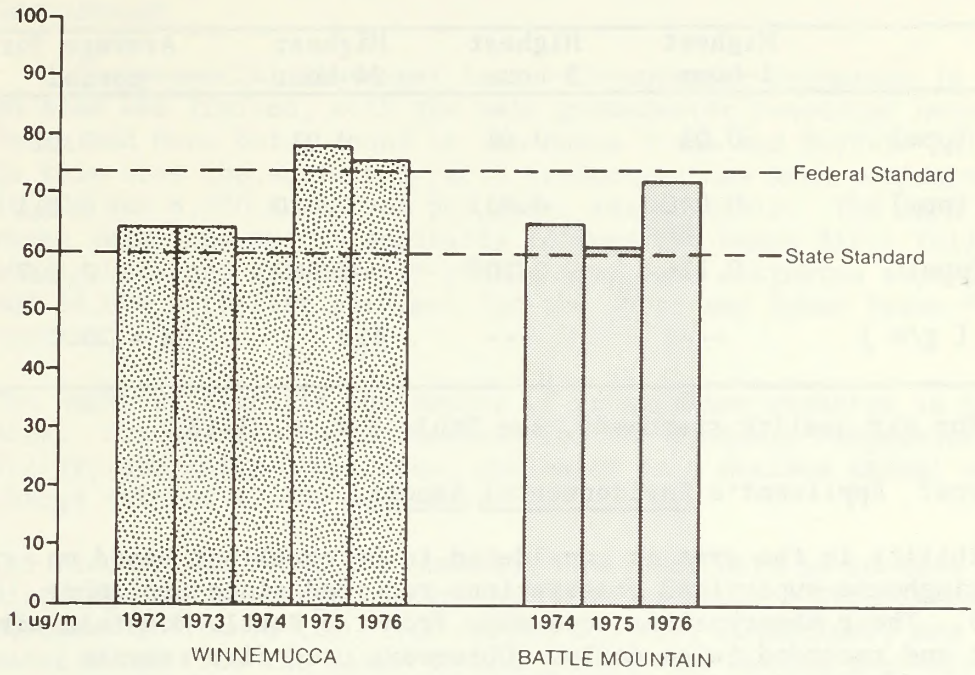
Environmental Statement Area

Existing air quality in the ES area is considered to be good, with few sources of gaseous pollutants existing outside the populated areas and some isolated industrial or transportation related sources. The most recent sulfur dioxide (SO_2) sampling done in the areas was in 1971 (by the State of Nevada) with concentrations being near the minimum detectable level. Based on these low levels, the sampling program was discontinued in the area after gathering one year's data. Compared with the Nevada Air Quality standard for SO_2 of 60 micrograms per cubic meter ($\mu g/m^3$) the annual arithmetic mean concentrations were as follows:

Carson City	$<10\ \mu g/m^3$
Fernley	$<5\ \mu g/m^3$
Minden	$<10\ \mu g/m^3$
Tahoe	$<5\ \mu g/m^3$
Virginia City	$<5\ \mu g/m^3$
Yerington	$<15\ \mu g/m^3$

Particulate levels in the ES area are a persistent problem due to wind-borne fugitive dust. While it is impossible to accurately assess the contribution man's activities make to overall dust concentrations within this area, it is reasonable to assume that activities ranging in scope from Off-Road Recreational Vehicle (ORV) use in desert areas to development of agriculture can all be potential sources of particulate air pollution. Figure 2-3

summarizes sampling results for total suspended particulates at Battle Mountain and Winnemucca as gathered by the Nevada Division of Environmental Protection Services.



1. ug/m Micrograms per Cubic Meter

SOURCE: State of Nevada, Dept. of Human Resources
AMBIENT AIR MONITORING AND AIR QUALITY TREND REPORT, 1976

FIGURE 2-3 — TOTAL SUSPENDED PARTICULATES ANNUAL GEOMETRIC MEANS

Project Site Area

Ambient air quality sampling at the proposed plant site was started by Westinghouse in July 1975. As with the larger ES area, air quality at the plant site is characterized by low levels of pollutants with the exception of occasions when wind-borne fugitive dust exceeds the 24-hour standard. Although Westinghouse Electric conducted the sampling program, the Nevada Division of Environmental Protection Services has been involved throughout and has calibrated the instruments used. Results of the background sampling program are summarized in Table 2-7, p. 2-22 .

TABLE 2-7
SUMMARY OF BACKGROUND AIR QUALITY MEASUREMENTS
NORTH VALMY SITE - JULY 1975 THROUGH MAY 1976[a/]

	Highest 1-hour	Highest 3-hour	Highest 24-hour	Average for period
SO_2 (ppm)	0.01	0.01	0.01	0.01
NO_2 (ppm)	0.040	0.031	0.020	0.011
O_3 (ppm)	0.116	0.107	0.069	0.027
TSP (g/m)	---	---	410	GM = 26.2

a/ For air quality standards, see Table 3-4, p. 3-13 .

Source: Applicant's Environmental Report.

Visibility in the area is considered to be excellent based on Westinghouse-supervised observations recorded since September 1975. Their observations were made from the Battle Mountain airport and recorded twice daily. Observers used five terrain points ranging from 40 to 89 miles away and recorded if the point was or was not visible and, if not, the reason was documented. Overall, the five points could be seen 85 percent of the time, with a prevailing visibility in the Valmy area of at least 60 miles. The most common restriction to visibility was weather condition (snow or rain) with blowing dust, haze, fog, and smoke accounting for the remaining occurrences. Details of this background analysis are contained in the Applicant's Environmental Report, Addendum II.

Water Resources

Groundwater

Environmental Statement Area. Groundwater resources in the ES area are limited, with the main groundwater resources between Valmy and Reno being found in the Buena Vista and Buffalo Valleys. In this area the sustained yield production has been estimated at 10,000 and 8,000 acre-feet per year, respectively. The area between Valmy and Austin generally follows the Reese River Valley, where sustained groundwater yields have been estimated at 37,000 and 34,000 acre-feet per year for the upper and lower Reese Valley systems.

The Humboldt River is one source of groundwater recharge in the area. Groundwater appropriations for the Clovers, Pumpernickel Valley, and Kelly Creek areas are based on a maximum annual recharge rate of 72,000 acre-feet.

The floodplains along the Humboldt River act both as an area of discharge and recharge, depending on river stage. Groundwater movement is toward the river during low-flow conditions, and water moves from the river to the groundwater during high-flow conditions.

Project Site Area. Of the stratigraphic units at the project site (see Table C-4, p. 10-21), only the lower 10 to 20 feet of the sequence (Unit #4) is water saturated and contains compressible materials. Production potential from this area is limited. Pumping for those test wells drilled by the Applicant near the proposed site were in the 20 gallons per minute (gpm) range, and are not representative of the actual rates which may be realized from production wells.

Tight clays and silts which occur at shallow depths below the Humboldt River floodplain deposits do not permit free interchange of water between the deposits and the deeper water-bearing formations. A number of flowing wells along the valley indicate the water in these deeper water-bearing formations is confined and cannot move readily upward.

There is a large amount of water in storage in the groundwater aquifer to be tapped by the production wells for the plant. About 400,000 acre-feet of groundwater is in storage in the proposed wellfield southwest of the Humboldt River at least a mile from the river. An estimated 700,000 acre-feet of groundwater is in storage in the 37 sections of land area considered for the wellfield north of the Humboldt River. The State of Nevada list

of water appropriations, which includes the Sierra Pacific allocations for the Pumpernickel Valley, Kelly Creek, and the Clovers area, indicates the total amount of groundwater allocated is below the annual recharge rate of 72,000 acre-feet. The listing shows 53,867 acre-feet appropriated per year for these three areas. For the two wellfields proposed for the project, see Figure 1-4, p. 1-24 .

Surface Water

Environmental Statement Area. Waterways in the ES area include the Truckee, Humboldt, and Reese Rivers, and several smaller water courses such as Italian, Boone, and Silver Creeks north of Austin. Some of the smaller creeks are dry part of the year, while others flow yearlong and support riparian vegetation. Table 2-8, p. 2-25 , gives the average discharge in acre-feet per year (and flow in cubic feet per second) at selected gaging stations along the rivers. Surface water flow in the Reese River seldom reaches the Humboldt except during high flow periods, and the lower Reese generally contributes only underflow to the Humboldt.

Project Site Area. The Humboldt River flows through the project site, with the closest river approach to the plant complex being 1.5 miles. Stream flow in the Humboldt is quite variable on a seasonal basis, high flows occurring in late May to early June and low flows from late August to early September. The available water supply in the project site area is given as 176,000 acre-feet per year (Eakin and Lamb, 1966).

Although zero surface flow has been recorded in the Humboldt River above and below the project site, a considerable amount of water was still moving downstream in the streambed itself. This flow is referred to as underflow, and is characteristic of streams with unconsolidated material in the streambed and whose drainage basins are in low rainfall areas. Figure 2-4, p. 2-26 shows average flow of the Humboldt River near Battle Mountain. Table 2-9 and 2-10, p. 2-27 , shows predicted flood flows for the Humboldt, Truckee, and Carson River Basins.

Water Quality

Environmental Statement Area. Water quality in both the groundwater system and the surface water system is relatively free of pollution from man-made sources although the general water quality reflects what can be expected in dry, high-evaporation, internal drainage water systems.

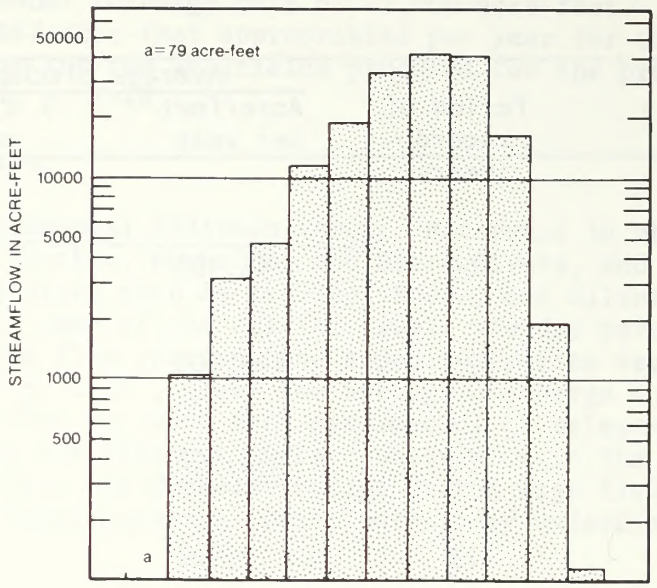
TABLE 2-8
AVERAGE RIVER AND STREAM DISCHARGE

Station name	Period of record (years)	Average discharge	
		Acre/feet per year	Cubic feet per second
Humboldt River near Rye Patch	60	146,300	202
Humboldt River near Imlay	35	143,500	198
Humboldt River at Battle Mountain	32	243,400	336
Reese River near Ione	23	7,900	11
Reese River near Battle Mountain	12	72	0.1
Truckee River at Vista	46	585,400	808
Truckee River at Wadsworth	9	476,000	657

Data compiled from "Water Resources for Nevada," 1974, prepared by U. S. Geological Survey.

Waters in the Humboldt River flowing through Humboldt County have been classified as Class C. Water quality of the Humboldt River is shown in Table D-2, p. 10-29 . Table D-1, p. 10-28 , gives the quality standards for such waters. The State of Nevada classifies waters as A, B, C, or D. There are quantitative standards for various parameters (for example, pH and dissolved solids) within these classifications. A brief explanation of the distinctions among A, B, C, and D waters follows.

Class A Waters: This classification is intended primarily to include waters or portions thereof located in areas of little human habitation, no industrial development or intensive agriculture and where the watershed is relatively undisturbed by man's activity. Beneficial uses are: drinking water supply with treatment by disinfection only, aquatic life habitat, wildlife propagation, agricultural use, recreation, boating, and aesthetics.



SOURCE: Nevada Dept. of Conservation and Natural Resource "Water Resources Bulletin #27," 1964

FIGURE 2-4 — AVERAGE MONTHLY FLOW OF THE HUMBOLDT RIVER AT THE COMUS GAGING STATION, WATER YEARS 1949-62

Class B Waters: This classification includes waters or portions thereof which are located in areas of light or moderate human habitation, little industrial development, light to moderate agricultural development, and where the watershed is only moderately influenced by man's activity. Beneficial uses are: drinking water supply with treatment by disinfection and filtration only, agricultural use, aquatic life and wildlife propagation, recreation, industrial supply, and aesthetics.

Class C Waters: This classification includes waters or portions thereof which are located in areas of moderate to urban human habitation, industrial developments present in moderate amounts, intensive agricultural practices, and the watershed considerably altered by man's activity. Beneficial uses are: domestic water supply following complete treatment, agricultural use, aquatic life, wildlife propagation, recreation, aesthetics, and industrial supply.

TABLE 2-9
PREDICTED FLOOD FLOWS HUMDOLDT RIVER BASIN[a/]

Stream location	Recurrence interval (years) 2	5	10	25	50
Humboldt River near Argenta					5,900
Humboldt River near Battle Mountain					5,900
Humboldt River near Valmy					5,900
Humboldt River at Comus					5,900
Humboldt River near Imlay					5,300
Reese River near Austin[b/]	500	1,000	1,400	2,500	4,000
Reese River near Battle Mountain[b/]	800	1,400	2,200	3,800	5,900

a/ Values given in cfs.

b/ Determined from regional frequency curves.

Source: Applicant's Environmental Report.

TABLE 2-10
PREDICTED FLOOD FLOWS (50-YEAR RECURRENCE INTERVAL)
TRUCKEE AND CARSON RIVER BASINS

Stream location	Flow (cfs)
Truckee River at Reno	19,400
Truckee River at Vista	19,400
Truckee River below Derby Dam	19,400
Truckee River near Nixon	19,400
Carson River near Fort Churchill	8,750

Source: Applicant's Environmental Report.

Class D Waters: This classification includes waters or portions thereof located in areas of urban development, highly industrialized or intensively used for agriculture, or a combination of all the above and where effluent sources include a multiplicity of waste discharges from the highly altered watershed. Beneficial uses are: boating and aesthetics, aquatic life, agricultural use, and industrial supply except for food processing purposes.

Groundwater quality varies according to the type of materials which make up the aquifer. For those areas underlain by the Lake Lahontan-era sediments, there is a marked tendency toward very hard waters with a high dissolved solids content. Waters pumped from the alluvium along existing streams are usually fairly consistent with regard to dissolved solids concentration. Such values generally range between 500 to 700 parts per million (ppm), and the water is classed as a sodium-bicarbonate type. Specific areas, however, may vary markedly from these averages, especially in the vicinity of playas or geothermal springs. In these cases, the water is often of poor quality, being non-potable and unsuitable for irrigation purposes.

There is a wide range of groundwater quality in the ES area. This is a function of the tendency of groundwaters to acquire greater concentrations of dissolved solids as they move from areas of recharge to areas of discharge. Because of the closed basin conditions which exists in Nevada, this results in poor groundwater conditions toward the centers of all playas which are topographically closed in the subsurface. Some exceptions to this condition exist where an isolated, confined aquifer has a direct recharge to the mountains without any vertical or lateral seepage of lower-quality groundwater from the surrounding playas.

Project Site Area. In the vicinity of the plant site, groundwater quality is within limits set for public and irrigation water supplies except for the water immediately adjacent to the geothermal spring located in Section 11, T 35N, R 43E, northeast of the site. Data from wells drilled specifically for the project are shown in Tables D-4 and D-5, p. 10-31 . The observed parameters indicate some areas are in excess of the recommended public drinking water supply concentrations for sulfate and total dissolved solids. A general overview of the surface and groundwater quality in the vicinity of the project site is given in the tables in Appendix D, p. 10-1.

Vegetation

The vegetation of the ES area, as shown on the Vegetation Map, p. 2-31 , is composed of several types, ranging from the salt desert shrubs of the valleys to the northern desert shrubs and pinyon-juniper woodland found at higher elevations. Small areas of riparian vegetation are found along waterways and around springs, with irrigated crops and grasslands also scattered throughout the region. Vegetative types on the project site are shown in Table 2-11, below.

TABLE 2-11
VEGETATIVE TYPES ON THE NORTH VALMY STATION SITE

Vegetative type	Acres	Percent
Salt desert shrub:		
Shadscale/bud sagebrush	4,290	31.5
Greasewood/bud sagebrush	4,084	29.9
Greasewood/saltgrass	927	6.8
Greasewood/rabbitbrush	914	6.7
Greasewood	628	4.6
Irrigated grassland	276	2.0
Riparian:		
Willow	2,345	17.2
Marsh	23	0.2
Total	13,487	98.9*

*The remaining 1.1 percent consists of the highway, the river, and the railroads.

The information presented below has been derived from field investigation, Bureau of Land Management (BLM) resource data, published literature, and the Applicant's Environmental Report. Although discussed separately, vegetative communities frequently overlap or are intermingled, with some species found in more than one community. Capabilities for revegetation are briefly mentioned. Further data on revegetation can be found in the Oreana-Hunt Final Environmental Statement, p. 10-27. Typical plant species, listed by vegetative type, are found in Table 2-12, p. 2-30 , of this statement.

TABLE 2-12
REPRESENTATIVE PLANT SPECIES BY VEGETATIVE TYPE

Salt Desert Shrub

Big greasewood community:

Big greasewood	*Sarcobatus vermiculatus*
Shadscale	*Atriplex confertifolia*
Budsage	*Artemisia spinescens*
Spiny hopsage	*Grayia spinosa*
Dalea	*Dalea polyadenia*
Spiny horsebrush	*Tetradymia spinosa*
Rubber rabbitbrush	*Chrysothamnus nauseosus*
Big saltbrush	*Atriplex lentiformis*
Squirreltail	*Sitanion hystrix*
Great Basin wildrye	*Elymus cinereus*
Saltgrass	*Distichlis stricta*
Alkali sacaton	*Sporobolis airedes*
Halogeton	*Halogeton glomeratus*
Inkweed	*Suaeda torreyana*
Pickleweed	*Allenrolfea occidentalis*
Tansy mustard	*Descurainia sophia*
Clasping pepperweed	*Lepidium perfoliatum*
Desert mentzelia	*Mentzelia multiflora*

Shadscale community:

Shadscale	*Atriplex confertifolia*
Dryland greasewood	*Sarcobatus baileyi*
Budsage	*Artemisia spinescens*
Big sagebrush	*Artemisia tridentata*
Low rabbitbrush	*Chrysothamnus viscidiflorus*
Burro brush	*Hymenoclea salsola*
Mormon tea	*Ephedra nevadensis*
Spiny hopsage	*Grayia spinosa*
Spiny horsebrush	*Tetradymia spinosa*
Littleleaf horsebrush	*Tetradymia glabrata*
Dalea	*Dalea polyadenia*
Winterfat	*Eurotia lanata*
Cheatgrass	*Bromus tectorum*
Indian ricegrass	*Oryzopsis hymenoides*
Squirreltail	*Sitanion hystrix*
Desert needlegrass	*Stipa speciosa*
Gooseberry-leaf globemallow	*Sphaeralcea grossulariaefolia*
Clasping pepperweed	*Lepidium perfoliatum*
Tansy mustard	*Descurainia sophia*
Skeleton plant	*Lygodesmia spinosa*
Pursh locoweed	*Astragalus purshii*
Prince's plume	*Stanleya pinnata*

Freshwater Marsh

Narrow-leaved cattail	*Typha angustifolia*
Alkali bulrush	*Scirpus robustus*
Three-square bulrush	*Scirpus americanus*
Common tule	*Scirpus acutus*
Bulrush	*Scirpus nevadensis*
Sedge	*Carex* spp.
Rush	*Juncus* spp.
Spike-rush	*Heleocharis* spp.
Pondweed	*Potamogeton pectinatus*
Widgeon grass	*Ruppia maritima*
Muskgrass	*Chara* spp.

Northern Desert Shrub

Big sagebrush community:

Big sagebrush	*Artemisia tridentata*
Spiny hopsage	*Grayia spinosa*
Low rabbitbrush	*Chrysothamnus viscidiflorus*
Spineless horsebrush	*Tetradymia canescens*
Littleleaf horsebrush	*Tetradymia glabrata*
Bitterbrush	*Purshia tridentata*
Mormon tea	*Ephedra nevadensis*
Cheatgrass	*Bromus tectorum*
Sandberg bluegrass	*Poa secunda*
Nevada bluegrass	*Poa nevadensis*
Idaho fescue	*Festuca idahoensis*
Squirreltail	*Sitanion hystrix*
Thurber's needlegrass	*Stipa thurberiana*
Great Basin wildrye	*Elymus cinereus*
Bluebunch wheatgrass	*Agropyron spicatum*
Arrowleaf balsamroot	*Balsamorhiza sagittata*
Tailcup lupine	*Lupinus caudatus*
Tapertip hawksbeard	*Crepis acuminata*
Halogeton	*Halogeton glomeratus*

Low sagebrush community:

Low sagebrush	*Artemisia arbuscula*
Yellowbrush	*Chrysothamnus viscidiflorus* var. *puberulus*
Big sagebrush	*Artemisia triaentata*
Bitterbrush	*Purshia tridentata*
Snowberry	*Symphoricarpos longiflorus*
Serviceberry	*Amelanchier alnifolia*
Currant	*Ribes* spp.
Shrubby eriogonum	*Eriogonum* spp.
Sandberg bluegrass	*Poa secunda*
Idaho fescue	*Festuca idahoensis*
Squirreltail	*Sitanion hystrix*
Thurber's needlegrass	*Stipa thurberiana*
Bluebunch wheatgrass	*Agropyron spicatum*
Locoweed	*Astragalus* spp.
Phlox	*Phlox* spp.
Mat eriogonum	*Eriogonum caespitosum*
Slender eriogonum	*Eriogonum microthecum*
Penstemon	*Penstemon* spp.
Foothill death camas	*Zigadenus paniculatus*
Lupine	*Lupinus* spp.
Mulesear	*Wyethia amplexicaulus*

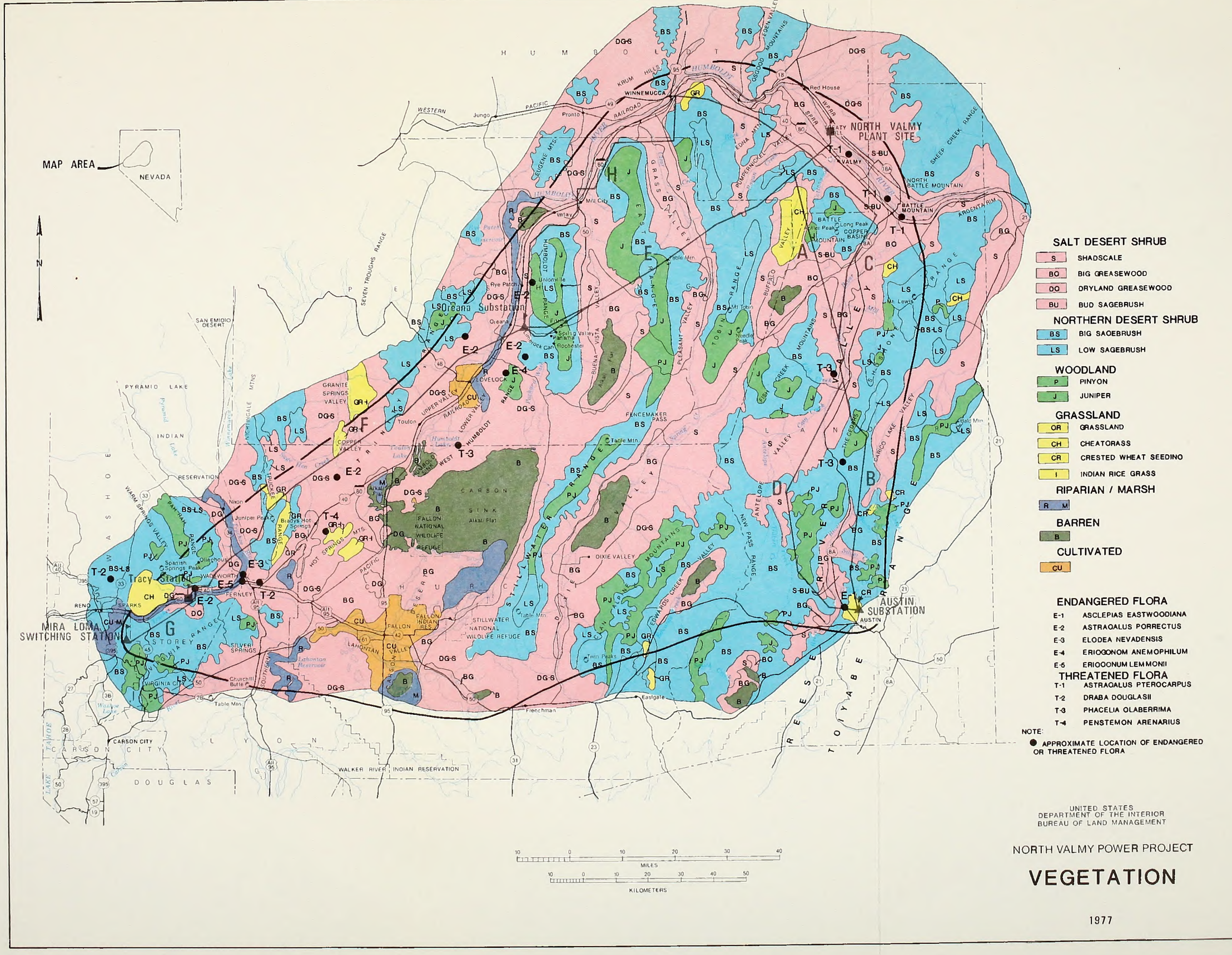
Endangered Flora	Threatened Flora
Asclepias eastwoodiana	*Astragalus pterocarpus*
Astragalus porrectus	*Draba douglasii*
Elodea nevadensis	*Phacelia glaberrima*
Eriogonum anemophilum	
Eriogonum lemmonii	
Machaeranthera leucanthemifolia	

Pinyon-Juniper Woodland

Single-leaved pinyon	*Pinus monophylla*
Utah juniper	*Juniperus osteosperma*
Big sagebrush	*Artemisia tridentata*
Low sagebrush	*Artemisia arbuscula*
Rubber rabbitbrush	*Chrysothamnus nauseosus*
Yellowbrush	*Chrysothamnus viscidiflorus* var. *puberulus*
Prickly phlox	*Leptodactylon pungens*
Mormon tea	*Ephedra nevadensis*
Squaw tea	*Ephedra viridis*
Buckwheat	*Eriogonum* spp.
Spiny hopsage	*Grayia spinosa*
Bitterbrush	*Purshia tridentata*
Serviceberry	*Amelanchier alnifolia*
Skeleton plant	*Lygodesmia spinosa*
Cheatgrass	*Bromus tectorum*
Sandberg bluegrass	*Poa secunda*
Squirreltail	*Sitanion hystrix*
Indian ricegrass	*Oryzopsis hymenoides*
Great Basin wildrye	*Elymus cinereus*
Needle and thread	*Stipa comata*

Meadow/Riparian

Fremont cottonwood	*Populus fremontii*
Willow	*Salix* spp.
Wood's rose	*Rosa woodsii*
Silver buffaloberry	*Shepherdia argentea*
Streambank wheatgrass	*Agropyron riparium*
Slender wheatgrass	*Agropyron trachycaulum*
Red top	*Agrostis alba*
Spike bentgrass	*Agrostis exarata*
Saltgrass	*Distichlis stricta*
Creeping wildrye	*Elymus triticoides*
Foxtail barley	*Hordeum jubatum*
Meadow barley	*Hordeum brachyantherum*
Timothy	*Phleum pratense*
Bluegrass	*Poa* spp.
Beard grass	*Polypogon monospeliensis*
Sedge	*Carex* spp.
Rush	*Juncus* spp.
Western yarrow	*Achillea lanulosa*
Aster	*Aster adscendens*
Bull thistle	*Cirsium vulgare*
Cinquefoil	*Potentilla flabelliformis*
Curly dock	*Rumex crispus*
Common dandelion	*Taraxacum officirale*
Rocky Mountain iris	*Iris missouriensis*


MAP AREA
NEVADA
N
HUMBOLDT
PERSHING
LANDER
EUREKA
CHURCHILL
LYON
DOUGLAS
WASHOE
CARSON CITY
WINNEMUCCA
Red House
NORTH VALMY PLANT SITE
VALMY
NORTH BATTLE MOUNTAIN
BATTLE MOUNTAIN
Mill City
Imlay
Unionville
Rye Patch
Oreana Substation
Oreana
Spring Valley
Panama
Rochester
Lovelock
Toulon
Table Mtn
Red Rock Canyon
Buena Vista
Alkali Flat
Needle Peak
Mt Tobin
Mt Lewis
Bald Mtn
Fencemaker Pass
Granite Springs Valley
Copper Valley
Upper Valley
Lower Valley
Humboldt Lake
Humboldt Sink West
Carson Sink
Carson Sink Alkali Flat
Fallon National Wildlife Refuge
Fallon Indian Res.
Stillwater National Wildlife Refuge
Oixie Valley
Edwards Creek Valley
Twin Peaks
Eastgate
Frenchman
Austin
Austin Substation
Tracy Station
Mira Loma Switching Station
Reno
Sparks
Fernley
Wadsworth
Virginia City
Silver Springs
Churchill Butte
Lahontan Reservoir
Pyramid Lake
Indian Lakes
Walker River Indian Reservation
Nixon
Juniper Peak
Olinghouse
Spanish Springs Peak
Biodys Hot Springs
Table Mtn
Pumpernickel Valley
Edna Mtn
Grass Valley
Sheep Creek Range
Argenta Rim
Long Peak
Copper Basin
Mountain
Battle
Mountain
Buffalo Valley
Pleasant Valley
Creek Mountains
Fish
Shoshone Range
Augusta Mountains
Antelope Valley
Pine Grove Hills
Toiyabe Range
Reese River Valley
Big Smoky Valley
Cortez Mountains
Monitor Valley
Diamond Mountains
Eugene Mts
Krum Hills
Osgood Mountains
Eden Valley
Warm Springs
Hot Springs Mts
Pah Rah Range
Virginia Range
Truckee River
Humboldt River
Pacific Railroad
Western Pacific Railroad
Seven Troughs Range
San Emidio Desert
Granite Mountains
Stillwater Range
Clan Alpine Mountains
New Pass Range
Shoshone Mountains
Cortez Mountains
Carico Lake Valley
Big Smoky Valley
Reese River Valley
Toiyabe Range
Monitor Valley
Diamond Mountains
Pine Grove Hills
Augusta Mountains
Antelope Valley

Salt Desert Shrub

A variety of plant communities can be found in this vegetative type, depending on soil conditions, depth of the water table, and other factors.

In the valley bottoms, in the floodplains along rivers, and in other areas associated with a relatively high water table (18 to 36 inches), plant communities featuring big greasewood are found. Common associations are greasewood/bud sagebrush, greasewood/saltgrass, and greasewood/rabbitbrush.

At slightly higher elevations on alluvial fans and along the toe slopes of the mountain ranges, shadscale becomes dominant and big greasewood disappears. The most common association is shadscale/bud sagebrush followed by shadscale/dryland greasewood. Cheatgrass is frequently the most abundant species in the understory. A number of additional shrubs and grasses, as well as forbs, are found scattered in small numbers. The annual weed halogeton, which is poisonous to livestock, frequently invades areas where the soil has been disturbed.

Revegetation within the salt desert shrub type is difficult to impossible largely due to the dry climate (Rollins, et al., 1968; Bleak, et al., 1965). A major portion of the ES area falls within this vegetative type.

Riparian

The riparian communities are found in narrow strips around springs, creeks, river bottom drainages, and floodplains, often intermingled with cropland, meadows, and irrigated native grasslands.

Typical species are: willow, rose, meadow grasses, rushes, sedges, and numerous forbs. Freshwater marshes feature emergent vegetation such as bulrushes and cattails, and submergent forms such as pondweed, widgeongrass, and muskgrass. Revegetation of the meadow/riparian communities is relatively easy.

Northern Desert Shrub

The communities in this vegetative type are dominated by various forms of sagebrush in association with other shrubs and grasses.

The big sagebrush communities are diverse, occurring on floodplains, terraces, ridges, and mountain slopes. The associated vegetation varies with the location and growing conditions, and includes (in separate associations) bluebunch wheatgrass, cheatgrass, rubber rabbitbrush, and yellowbrush/bluegrass. Other

shrubs and grasses are found unevenly distributed in small numbers. Revegetation can be fairly easy using standard revegetation techniques.

Communities dominated by low sagebrush are found at the higher elevations on ridges, mountain slopes, and some alluvial fans. Low sagebrush can be seen interspersed with big sagebrush, although it is typically found on shallower, rockier, finer-textured soils. Other shrubs are found in small numbers, and large amounts of forbs are scattered throughout. Revegetation can be moderately difficult depending on soil, slope, and stoniness.

Pinyon-Juniper Woodland

The plant community dominated by the single-leaved pinyon pine generally occupies steep, rugged areas between the big and low sagebrush communities (6,000-7,500 feet). The Utah juniper (popularly referred to as cedar) is encountered at the lower reaches of this community, with the pinyon restricted to the higher elevations.

Shrubs in the understory include big and low sagebrush, bitterbrush, and rabbitbrush. Grasses include bluegrass, Idaho fescue, and cheatgrass. Because of the steep slopes and/or cheatgrass, the pinyon-juniper woodland may be fairly difficult to revegetate.

Grassland

These communities occupy areas within other communities at all elevations and rainfall zones. In the high mountains there are small communities of bluegrasses. Found at the lower elevations in the valleys are grassland communities characterized by saltgrass, Indian ricegrass, or cheatgrass. In the big sagebrush areas, grasslands of crested wheatgrass have been created by artificial seeding. Along some of the river bottom areas, native grasses are harvested as meadow hay.

Revegetation of grassland depends on the specific conditions or area involved. (For example, the dominance of cheatgrass, a strong competitor, or the presence of arid conditions can make revegetation very difficult.)

Threatened or Endangered Species

Ten threatened or endangered plant species identified from lists published in the Federal Register on July 1, 1975, and June 16, 1976, are reported in or near the ES area. The official status of these species is still pending. Their locations are identified on the Vegetation Map, p. 2-31 . A discussion of each species based on literature and herbarium collections is contained

in Table 2-13, p. 2-36 . Additional information on threatened or endangered flora in the ES Area is available upon request from the BLM, Nevada State Office, Reno, Nevada.

Chemical Analysis

Samples of vegetation taken in the project site area and analyzed by Westinghouse for trace elements show below average concentrations (except for the elements arsenic and molybdenum) as compared with other shrubs within the United States.

TABLE 2-13
THREATENED OR ENDANGERED FLORA VALMY ES AREA

Species	Status[a/]	Flowering time	Soil	Location	Elevation (feet)	Comments	Reference
Asclepias eastwoodiana	E	June	Limestone derived; alkali	Hills 6 miles northwest of Austin	5,800	Associated with A. *cryptoceras*.	Barneby, 1945.
Astragalus porrectus	E	May-June	Gravel, volcanic sand, rock debris	Trinity Mountains; west Humboldt Mountains east of Woolsey	4,300-5,000	Rare and local, known only from the lower Humboldt and Truckee Valleys in Churchill, Pershing and southern Washoe Counties, Nevada; bed of Lake Lahontan.	Barneby, 1964; Herbarium notes.
Elodea nevadensis	PE			Ponds near Wadsworth		Aquatic plant eliminated from type location.	St. John, 1962; unpublished notes.
Eriogonum anemophilum	E			Summits, north and west Humboldt Range; Mt. Rose			Greene, 1897; Herbarium notes.
Eriogonum lemmonii	E		Sandy	Sand hills near Reno*; Wadsworth, south side of railroad*, Lahontan, Churchill County; Wilson Canyon, Lyon County		*Lemmon's locations notoriously inaccurate	Lemmon, 1876; Herbarium notes, 1922, 1937.
Machaeranthera leucanthemifolia	E		Varied	West Humboldt Mountains	4,600-8,500	Widely spread over Nevada, according to herbarium information. Arthur Holmgren feels this is a variation of *M. canescens*, and neither threatened nor endangered.	Greene, 1896; Holmgren, 1977; Herbarium notes, 1966-74.
Astragalus pterocarpus	T	April-June	Alkaline and sandy	Battle Mountain; 10 miles west Battle Mountain; confluence Reese and Humboldt Rivers; Black Rock Desert; Jungo	4,450-4,500	Low gullied hills and alkaline sandy flats, saltgrass meadows and openings among halophytic shrubs; forms colonies.	Barneby, 1964; Herbarium notes, 1892-1973.
Draba douglasii	T	Ca. May	Rocky ridges	Hills north of Reno; 45 miles southwest Elko; Eureka County; 25 miles southeast Vya, Washoe County; 1 mile north Fernley, Washoe County; Peavine Mountain, Washoe County; Pine Forest Range, Humboldt County	4,800-9,000	Two varieties described by Hitchcock.	Hitchcock, 1941; Herbarium notes, 1909-1967.
Phacelia glaberrima	T		Alkaline	Humboldt Sink, 4,300 feet; Reese Valley, 5,000 feet; Reese River Valley, 32 miles north Austin (the Narrows)		Endemic to saline desert of north-central Nevada; known from three collections.	Howell, 1944.
Penstemon arenarius	T	May	Sand	3.5 miles southeast Brady Hot Springs; 12.8 miles west Desert Queen Mine on the underground cable road	4,300	Found in Churchill, Nye, and Mineral Counties. Cited locations in Churchill County extend previously known range.	Herbarium records; Field notes (1977).

a/ E = endangered; PE = possibly extinct; T = threatened.

Wildlife

Public lands within the ES area provide seven general types of habitat necessary for continued existence of wildlife populations. Four are broad vegetative types which, when combined, encompass over 95 percent of the surface acreage of the ES area. These vegetative types, discussed in the preceding vegetation section, include salt desert shrub, northern desert shrub, grassland, and pinyon-juniper woodland. The remaining three types--wetlands (marsh, riparian or stream side, and meadows), cliffs, and canyons--are limited in area, but of specific importance for wildlife.

The larger animals, especially predators and browsers, may range throughout the major vegetative zones. Smaller animals tend to be dependent upon, or have their greatest abundance in or on, the periphery of particular plant communities.

Table 2-14, p. 2-38 , shows representative species of each major habitat type of the ES area. A listing of wildlife species which may be found in the ES area during a given year is available on request from the Bureau of Land Management (BLM), Nevada State Office, Reno, Nevada, or from the BLM District Offices located throughout the State.

The bulk of available information on wildlife primarily relates to the life history and habitat requirements of game animals, especially the larger grazing animals such as mule deer and pronghorn antelope. The majority of data and observations on wildlife populations comes from the continuing and past efforts of the personnel of the State of Nevada Department of Fish and Game. Very little is known about food requirements, distribution, population dynamics, or key habitats of most small non-game creatures such as rodents, birds, and insects which inhabit the ES area. Applicable data and known interactions will be noted according to typical animal-habitat associations for these species.

Terrestrial Animals

Big Game. Mule deer, pronghorn antelope, and mountain lion are the big game species present in the ES area. An estimated population of 2,000 to 2,500 mule deer exist throughout the ES area with the greatest numbers occurring in the mountains. Deer migration over most of the area is characterized by elevational movement by season; higher elevations serve as summer range, with movement to lower elevations occurring in the winter. Concentration on winter ranges commonly occurs as a result of snow depth, preference for specific areas such as south slopes, or areas of

TABLE 2-14
ANIMAL SPECIES REPRESENTATIVE OF THE ES AREA LISTED ACCORDING TO SIMILARITIES IN HABITAT REQUIREMENTS, HABITATS, OR LIFE FORM

Habitat requirements	Big game	Small game & non-game mammals	Large predators and furbearers	Birds	Aquatic life	Reptiles	Insects
Dependent upon sagebrush for food or cover or nesting sites and/ur upland shrubs such as hitterbrush, fourwing saltbrush, winterfat.	Pronghorn angelope Mule deer	Mountain vole Deer mouse Lease chipmunk Whitetail jack-rabbit		Sage grouse Chukar Sage sparrow Lark sparrow Brewer's sparrow Green-tailed towhee Sagebrush lizard			
Require pinyon-juniper breaks or rough rocky topography for food cover, nesting sites, or combination thereof.		Mountain cottontail Bushytail woodrat Porcupine		Pygmy nuthatch Pinyon jay			
Feed on seeds, foliage, roots of weedy species, grasses, and/or nest un ground or grassland areas.		Kangaroo rat Northern grasshopper mouse Northern pocket gopher		Mourning dove Vesper sparrow Savannah sparrow Horned lark			
Highly insectivorous. Presence, density, and distribution is significantly influenced by status of local insect populations.		Hoary bat Little brown bat Vagrant shrew Grass hopper mouse		Common nighthawk Western kingbird Mountain bluebird Loggerhead shrike Meadowlard			
Primarily dependent on the riparian plant associations and/or meadow areas around streams or ponds for food, cover, nesting, breeding sites or combination thereof.		Raccoon Mink Striped skunk Long-tailed vule		Black-billed magpie Red-shafted flicker Wilson's snipe Eastern kingbird Traills flycatcher Goldfinch Long-billed marsh wren Robin Yellow warbler Yellowthroat Brown-headed cowbird		Western yellow-bellied racer Valley garter snake	
Composition of insects and spider populations and relative abundance of various groups vary with season, vegctative type and stage of succession. Invertebrates are one of the major groups of grazing animals							Springtails Long-horned grasshopper Short-horned grasshopper Leafhoppers Aphids Ground beetles Carrion beetles Moths Midges Mosquitos Wasps Ants Wolf spiders etc.
Exhibit high-to-total dependence upon stream, lake, or pond marsh biotic communities for continued existence.				Grebe Herons Geese Dabbling ducks Diving ducks Sandpipers Snipes Avocets Phalaropes	Salamanders Frogs Toads Trout Minnows Suckers		
Wide ranging and/or highly flexible predators. Prey to varying extents on most other groups. Presence, ahundanee, and distribution depend on prey species availability. Some are dependent upon presence of nesting sites, den areas, or burrows.			Coyote Red fox Bobcat	Great horned owl Cooper's hawk Red-tailed hawk Swainson's hawk Rough-legged hawk Ferruginous hawk Golden eagle Marsh hawk Prairie falcon Sparrow hawk		Bull snake Rattlesnake	

browse concentration. The critical winter areas are typified by big sagebrush/bitterbrush plant associations. Such areas can be found within the ES area along the Shoshone Range, Battle Mountain, Clan Alpine Mountains, Tobin Range, Sonoma Range, Stillwater Range, West Humboldt Range, and the Virginia Range. In addition, the riparian vegetation bordering the Humboldt River supports a limited yearlong mule deer population (see the Big Game Map, p. 2-41).

Densities in areas of yearlong habitat are estimated at five per square mile, with winter areas estimated at five to ten per square mile, depending on snow depth and the severity of the winter in general.

A small population of pronghorn antelope (5 to 15 animals) utilizes an area centered around Spanish Springs Peak. No defined kidding grounds or other critical antelope use areas have been identified (see the Big Game Map).

Population estimates for mountain lions are not available.

Small Game and Non-Game Mammals. The mountain cottontail and pygmy rabbit are the small game species of the ES area.

The ES area supports a diversity of small non-game mammals which provide a food base for many of the area's carnivores and raptors. Common small mammals include ground squirrel, pocket gophers, bat, porcupine, jackrabbit, and several species of mice. Population estimates for these species are not available.

Large Predators and Furbearers. Predatory mammals common within the ES area are coyote, bobcat, badger, weasel, gray fox, and striped skunk. Coyotes are found throughout the area in all but the most barren terrain. Bobcats, also widely distributed throughout the area, prefer steep rocky terrain and brushy areas which provide escape cover. Kit fox and red fox also occur in the area, and are protected by State law.

Birds

The most common bird species in the ES area are of the passerine songbird group. Often-noted species include the horned lark, sparrow, western bluebird, and shrike. Game birds within the area include sage grouse, chukar partridge, see-see partridge, gray partridge, mountain quail, valley quail, scaled quail, mourning dove, and ring-necked pheasant. No population estimates are available for these species in the ES area.

Crucial habitat for sage grouse include nesting areas (generally within a three to five mile radius from the strutting grounds which are the focal point for breeding), sagebrush covered wintering areas, and meadow areas utilized for summer brood habitat. The critical dependence of sage grouse upon sagebrush (in close association with meadows) results in extensive areas of crucial habitat, especially along the valley margins and upland areas of the Sonoma Range, New Pass Range, and Shoshone Range. (See the Upland Game Bird Map, p. 2-43.)

Crucial habitat for chukar, gray partridge, valley and mountain quail is associated with permanent water sources. Mourning doves occur throughout the area in spring and summer months, before migrating south. Ring-necked pheasant populations within the ES area are limited to the Lahontan Reservoir and to agricultural areas along the Humboldt River in the vicinity of Lovelock and Fernley. See-see partridge, mountain quail, and scaled quail are limited in distribution, with only a relatively small number occurring within the ES area. (See the Upland Game Bird Map.)

Scavenger birds, including the magpie, crow, raven, and turkey vulture, are distributed throughout the ES area, most commonly along highways and near human developments where roadkills and refuse are readily available.

Several species of hawks and owls utilize a variety of habitats within the ES area. These include the sparrow hawk, red-tailed hawk, golden eagle, great horned owl, burrowing owl, and prairie falcon, all of which nest within the ES area. Some of these species also winter in the area, along with such migrants as the bald eagle, osprey, and rough-legged hawk. Cliffs in association with aspen or riparian habitats are often preferred raptor nesting concentration areas. Known raptor concentration areas are shown on the Waterfowl, Fisheries, and Raptor Map, p. 2-45 , although population estimates for the area are not available.

Aquatic Animals

The ES area supports a variety of aquatic habitats--such as wet meadows, ponds, reservoirs, and streams--for a variety of species including fishes, invertebrates, amphibians, and water-associated mammals.

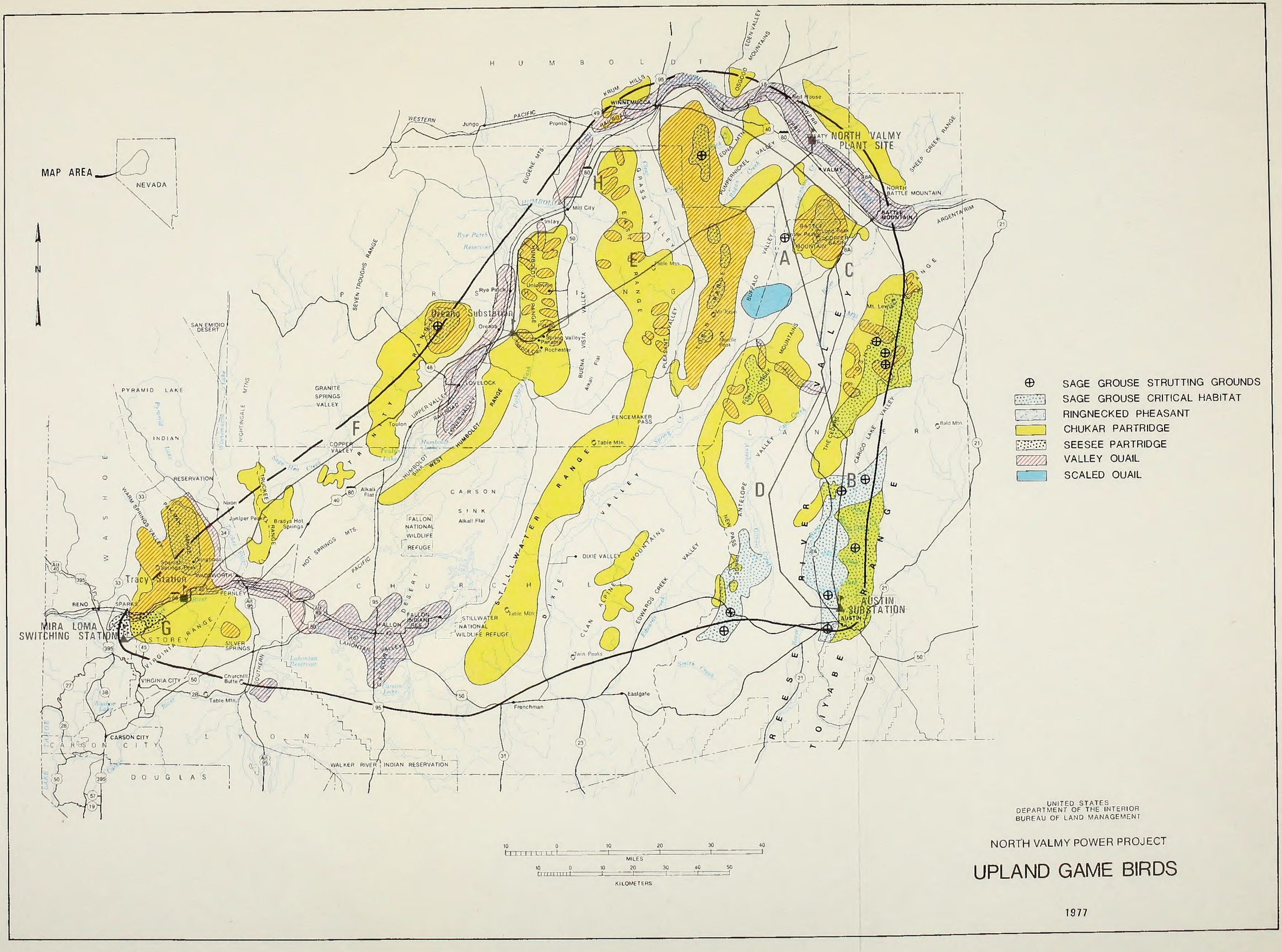
The Humboldt River Basin within which the ES area lies, provides many areas of waterfowl habitat (see the Waterfowl Map). Nine species (Canada goose, American coot, pintail, redbreasted merganser, common merganser, hooded merganser, mallard, cinnamon teak, and green-winged teal) are common to the ES area. Of the nine species noted, six were observed during the spring survey, two during summer, four during fall, and two during winter inves-

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

NORTH VALMY POWER PROJECT

BIG GAME

1977


MAP AREA
NEVADA
N
SAGE GROUSE STRUTTING GROUNDS
SAGE GROUSE CRITICAL HABITAT
RINGNECKED PHEASANT
CHUKAR PARTRIDGE
SEESEE PARTRIDGE
VALLEY QUAIL
SCALED QUAIL
NORTH VALMY PLANT SITE
Orovada Substation
Tracy Station
MIRA LOMA SWITCHING STATION
AUSTIN SUBSTATION
HUMBOLDT
WINNEMUCCA
Mill City
Imlay
Rye Patch Reservoir
Unionville
Oreana
Fireball
Spring Valley
Rochester
Toulon
Table Mtn.
Red House
VALMY
NORTH BATTLE MOUNTAIN
BATTLE MOUNTAIN
Mt. Lewis
Bald Mtn
Niron
Juniper Peak
Bradys Hot Springs
Alkali Flat
Dixie Valley
Twin Peaks
Eastgate
Frenchman
Churchill Butte
Fallon
Fallon Indian Res.
Stillwater National Wildlife Refuge
Fallon National Wildlife Refuge
Lahontan Reservoir
Carson Lake
Pyramid Lake
Indian Reservation
Walker River Indian Reservation
Reno
Sparks
Fernley
Wadsworth
Spanish Springs Peak
Kingsbury
Silver Springs
Virginia City
Carson City
Douglas
Lyon
Washoe
Pershing
Churchill
Lander
Eureka
Nye
Mineral
Esmeralda
Seven Troughs Range
Eugene Mts.
Humboldt Range
Grass Valley
Pumpernickel Valley
Edna Mtn.
Sheep Creek Range
Argenta Rim
Battle Mountain
Copper Basin
Buffalo Valley
Fencemaker Pass
Fish Creek Mountains
Cortez Mountains
Antelope Valley
New Pass
Clan Alpine Mountains
Edwards Creek Valley
Stillwater Range
Desert Range
Humboldt Range
Virginia Range
Storey Range
Pah Rah Range
Truckee Range
Hot Springs Mts.
Lovelock Range
Buena Vista Valley
Pleasant Valley
Carson Desert
Lahontan Valley
Warm Springs Valley
Truckee River
Humboldt River
Reese River Valley
Toiyabe Range
Cortez Range
Cargo Lake Valley
Krum Hills
Osgood Mountains
Eden Valley
Pacific
Western
Railroad
Alkali Flat
Fallon National Wildlife Refuge
Carson Sink
Humboldt Sink-West
Humboldt Sink-East
Humboldt Lake
Rye Patch Reservoir
Lahontan Reservoir
Carson Lake
Pyramid Lake
Winnemucca Lake
Walker Lake
Washoe Lake
Truckee River
Carson River
Humboldt River
Reese River
Smith Creek
Edwards Creek
Cottonwood Creek
Fish Creek
Cargo Lake
Antelope Valley
Dixie Valley
Buffalo Valley
Grass Valley
Pumpernickel Valley
Sheep Creek Range
Argenta Rim
Battle Mountain
Copper Basin

MAP AREA

NEVADA

FISHERIES

WATERFOWL AND WATER ASSOCIATED BIRD AREAS

RAPTOR CONCENTRATION AREA

WATERFOWL FLYWAY

NORTH VALMY PLANT SITE

Oreana Substation

Tracy Station

MIRA LOMA SWITCHING STATION

AUSTIN SUBSTATION

10 0 10 20 30 40 MILES

10 0 10 20 30 40 50 KILOMETERS

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

NORTH VALMY POWER PROJECT

WATERFOWL, FISHERIES & RAPTOR

1977

tigation of the proposed Valmy site (Applicant's Environmental Report). It is assumed that many additional species utilize the Humboldt drainage as a corridor within the larger Pacific Flyway, during migratory periods. (No population estimates are available for waterfowl use within the ES area.)

Waterfowl and water-associated species utilize the aquatic habitat provided by the Humboldt River and the occasional streams and reservoirs as rest areas during migration and for limited nesting and brood rearing during spring and summer months.

Stream habitat quality varies widely over the area, with species and overall numbers being dependent upon water quality and quantity. Streams supporting trout species generally provide suitable habitat only in their upper reaches, with lower sections commonly intermittent in nature. The Humboldt River section within the ES area supports introduced warm-water game fish species along with carp and other non-game species.

Threatened or Endangered Species

The American peregrine falcon, Falco peregrinus anatum, and the southern bald eagle, Haliaeetus leucocephalus leucocephalus, are classified as endangered species by the U. S. Fish and Wildlife Service and the State of Nevada Board of Fish and Game Commissioners. The bald eagle is known to winter in Nevada, but does not nest within the ES area. The occurrence of bald eagles in the ES area would be most probable in Lahontan Valley during winter months. Several peregrine falcon sightings were noted in western Nevada from 1972 to 1974. There are no records of peregrine falcons nesting in Nevada in recent years. Peregrine falcons have been noted primarily during winter months, before migrating out of the area in the spring.

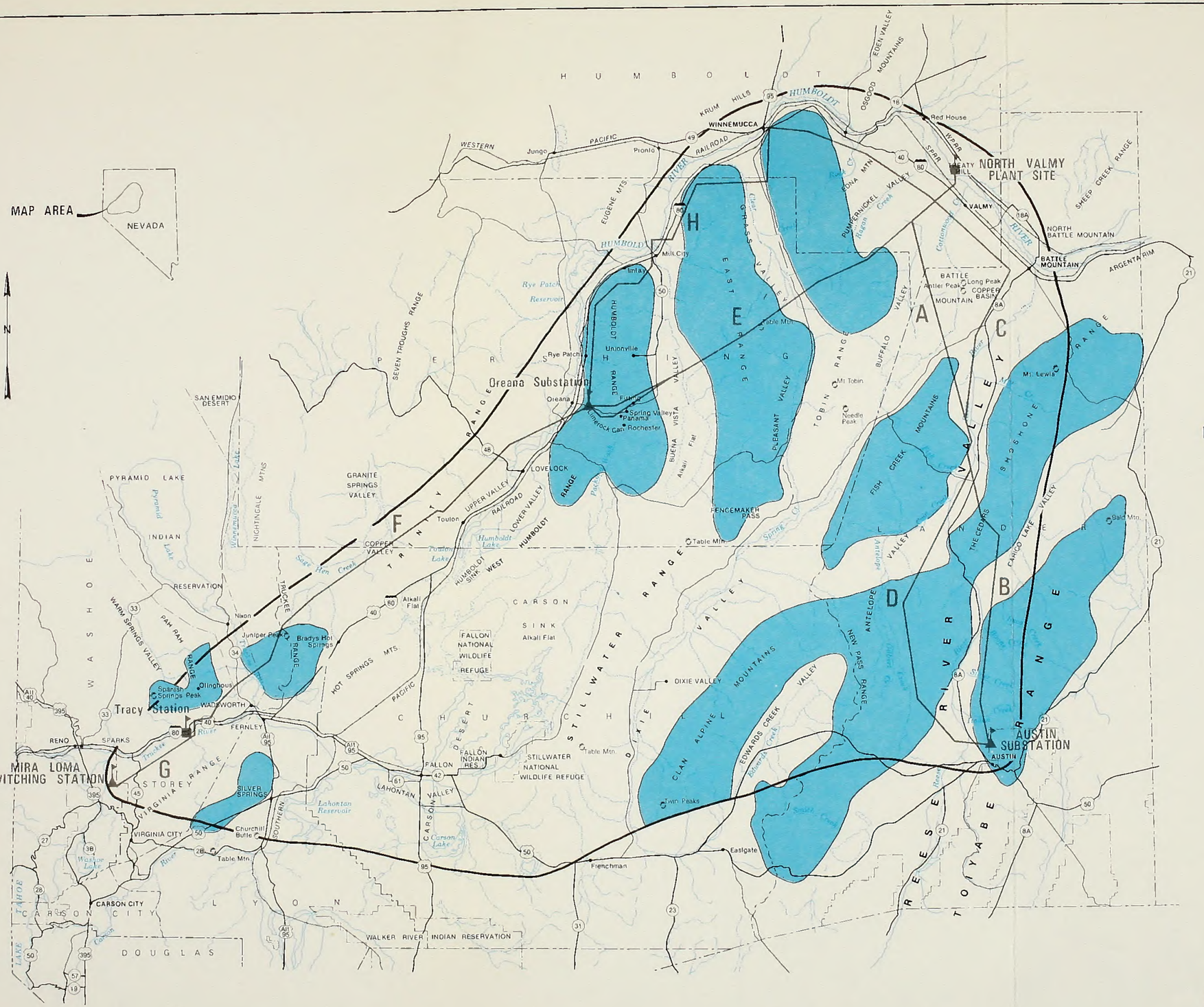
The ES area is within the range of the spotted bat, Euderma maculatum, which is classified by the State of Nevada Board of Fish and Game as a rare species.

Within the ES area there are 34 species of birds which are included in the National Audubon Society's "Blue List". This is a list of those species considered by the Society to be exhibiting non-cyclical population declines in all or a significant part of their range.

The Lahontan cutthroat trout was listed on June 16, 1975, as a threatened species under the Endangered Species Act of 1973. This species is native to the Humboldt River system and can be found in the Upper Reese River and in some small tributaries of the Humboldt drainage.

Wild Horses

Wild horse use within the ES area is confined primarily to the upland slopes and bench areas of the prominent mountain areas. (See the Wild Horse Map, p. 2-49 .) An estimated 3,700 head are indicated by wild horse inventories conducted in 1974, 1975, and 1976. Most colts are born between April and mid-June.


MAP AREA
NEVADA
N
WINNEMUCCA
Red House
NORTH VALMY PLANT SITE
VALMY
NORTH BATTLE MOUNTAIN
BATTLE MOUNTAIN
Jungo
Pronto
Mill City
Imlay
Rye Patch Reservoir
Oreana Substation
Oreana
Unionville
Rye Patch
Fireball
Spring Valley
Panama
Rochester
Toulon
LOVELOCK
GRANITE SPRINGS VALLEY
SAN EMIDIO DESERT
PYRAMID LAKE
INDIAN LAKE
RESERVATION
Nixon
Juniper Peak
Bradys Hot Springs
Spanish Springs Peak
Olinghouse
WADSWORTH
Tracy Station
FERNLEY
RENO
SPARKS
MIRA LOMA SWITCHING STATION
SILVER SPRINGS
VIRGINIA CITY
Churchill Butte
Table Mtn.
CARSON CITY
Alkali Flat
FALLON NATIONAL WILDLIFE REFUGE
FALLON
FALLON INDIAN RES.
STILLWATER NATIONAL WILDLIFE REFUGE
Table Mtn.
Lahontan Reservoir
Carson Lake
Fernchman
Eastgate
Table Mtn.
FENCEMAKER PASS
Mt. Tobin
Needle Peak
Mt. Lewis
Bald Mtn.
Twin Peaks
DIXIE VALLEY
WALKER RIVER INDIAN RESERVATION
DOUGLAS
LYON
CHURCHILL
CARSON
SINK
DESERT
H
E
A
D
B
G
F
TRINITY RANGE
SEVEN TROUGHS RANGE
HUMBOLDT RANGE
EAST RANGE
TOBIN RANGE
BUFFALO VALLEY
PUMPERNICKEL VALLEY
EDNA MTN
KRUM HILLS
EUGENE MTS
OSGOOD MOUNTAINS
EDEN VALLEY
SHEEP CREEK RANGE
ARGENTA RIM
BATTLE MOUNTAIN
Antler Peak
Long Peak
COPPER BASIN
MOUNTAIN
PAH RAH RANGE
WARM SPRINGS VALLEY
HOT SPRINGS MTS.
STILLWATER RANGE
CLAN ALPINE MOUNTAINS
FISH CREEK MOUNTAINS
SHOSHONE RANGE
THE CEDARS
CARICO LAKE VALLEY
ANTELOPE VALLEY
NEW PASS RANGE
EDWARDS CREEK VALLEY
SMITH CREEK VALLEY
REESE RIVER VALLEY
TOIYABE RANGE
AUSTIN SUBSTATION
AUSTIN
SILVER PEAK RANGE
VIRGINIA RANGE
PAH RAH RANGE
LAHONTAN VALLEY
CARSON VALLEY
BUENA VISTA Alkali Flat
HUMBOLDT SINK WEST
Humboldt Lake
Pyramid Lake
Winnemucca Lake
Pahute Lake
Walker Lake
Truckee River
Carson River
Humboldt River
Rye Patch Reservoir
Reese River
Big Creek
Kingston Creek
Edna Creek
Ragan Creek
Cottonwood Creek
Rock Creek
Spring Creek
Sage Hen Creek
Edwards Creek
Smith Creek
Big Antelope Creek
Little Antelope Creek
Kingston Creek
Birch Creek
Willow Creek
Mahogany Creek
Indian Creek
Fish Creek
Antelope Creek
Big

Land Uses and Ownership

Lands along the Humboldt River are characterized by checkerboard ownership. The remainder of the ES area has larger tracts of federal land with interspersed private ownership (see the Land Status Map, p. 2-53). Lands in the ES area are being used for a variety of purposes such as extensive livestock grazing and crop production, fish and wildlife habitat, outdoor recreation, mining, transportation, and utility systems.

Planning and Zoning

Federal, State, regional, and county groups are involved in planning in the ES area. Although some cross-agency coordination occurs, there is no overall coordination of these planning efforts.

Federal. For a discussion of federal actions involving construction of power plants and electrical transmission lines, see Chapter 1, p. 1-4 .

The Bureau of Land Management (BLM) has completed several multiple-use plans and is in the process of updating others in the area. These Management Framework Plans (MFPs) provide the basis for actions to manage public lands for multiple uses. The ES area is included in three BLM Districts--Carson City, Winnemucca, and Battle Mountain.

State. State actions involving construction and operation of power plants and transmission lines are discussed in Chapter 1, p. 1-5 .

The State Land Use Planning Agency was created by the 1973 Nevada legislature to develop a workable land use plan and management program for the State. Such a plan has not yet been approved. One of the present functions of this agency is to coordinate State review of major actions proposed by State and Federal agencies in Nevada.

Counties and Local Government. The counties within the ES area have planning and/or zoning commissions, and there are overlapping regional governments such as the Tahoe Regional Planning Agency; Washoe Council of Governments; the Regional Planning Commission of Reno, Sparks, and Washoe County; and the Central Nevada Resource Development Authority. Although local plans, ordinances, and zoning serve to indicate community concern with population density control and commercial development, there is little effect on population growth within the ES area. For example, at the present time transmission line proposals are reviewed by local governments only as to compliance with zoning regulations. No formal applications to county planning boards have been required of the utility company. However, the Applicant has been in informal contact with county planning boards concerning its plans.

Agriculture

Crop Production. Potatoes, garlic, onions, hay, small grains, and some seed crops are produced in the ES area. Native grasses are grown in meadow areas and irrigated by the Humboldt and Reese Rivers. In the Winnemucca area, potato production and processing are becoming increasingly important as additional land is being put into production. At the present time over 10,000 acres are producing potatoes which are being processed locally. Additionally, water has been allocated by the Nevada Department of Water Resources which could more than double current potato production. Specifically, these areas are:

Area	Acres	County
Upper Silver State Valley	2,240	Humboldt
Eden Valley	1,544	Humboldt
Imlay area	3,840	Pershing
North Battle Mountain area	3,520	Lander
Total	11,144	

Livestock Grazing. Livestock grazing is widely practiced over the ES area. Forage conditions in the ES area vary from very poor to moderate, with more than 25 percent of the livestock industry of northern Nevada dependent on BLM-administered lands. The carrying capacity for 87 percent of the project site is 20 acres per animal unit month (AUM), with the remainder at approximately eight acres per AUM. Over the entire ES area, the capacity ranges from a low of 12 to 20 acres per AUM to 50 to 70 acres per AUM.

Mineral Activities

Mining activity is fairly important to the local economies within the ES area. Roughly 10 percent of the total personal income in the northern Nevada area is derived from mining operations. Although mining produces a small part of the communities' total personal income, it should be noted that mineral products are basic resources required in almost all other sectors of economic activity. There are no apparent mineral deposits on the proposed project site; however, mountainous areas near the site have mineral deposits and existing mining activities. These areas are the Sonoma Range, the Osgood Mountains, Buffalo Mountain, Edna Mountain, and Battle Mountain. (See the Mineral Activities Maps, p. 10-23 .)

Transportation

Major transportation routes in the ES area include Interstate 80, U. S. Highways 95 and 50, and State Highway 8A. Interior roads of varying quality provide access within the ES area. The Southern

MAP AREA

NEVADA

N

PUBLIC LANDS

- PUBLIC LANDS
- NATIONAL FOREST
- BUREAU OF RECLAMATION WITHDRAWALS
- DEPARTMENT OF DEFENSE FACILITIES
- ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION
- FEDERAL WILDLIFE REFUGES
- FEDERAL WILDLIFE MANAGEMENT AREAS

PRIVATE LANDS

- INDIAN RESERVATIONS
- INDIAN TRUST ALLOTMENTS
- PRIVATE LANDS
- PATENTED LODE MINING CLAIMS

MILES 10 0 10 20 30 40

KILOMETERS 10 0 10 20 30 40 50

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

NORTH VALMY POWER PROJECT

LAND STATUS

1977

Pacific and Western Pacific Railroads roughly parallel each other and follow the Humboldt River and Interstate 80. (The ES Area Map, p. 1-11 , shows the transportation network.)

Utilities

The Sierra Pacific Power Company is a member of the Western States Coordination Council (WSCC), a consortium of electrical power interests composed of utility companies, utility cooperatives, and municipalities. The WSCC develops reliability criteria and other standards for its member organizations.

The Applicant's Tracy generating plant, located in the Truckee Canyon, provides electrical service via numerous distribution lines extending west and east from the plant to Reno, Carson City, Lake Tahoe, Lovelock, Fernley, Winnemucca, and Battle Mountain. The Reno-Carson City-Lake Tahoe area and the Lovelock District are the major load centers within the Applicant's Service Area, the former representing 78 percent of the total load requirement.

There are currently two major transmission lines in the ES area. Intertie No. 1, a 230 kilovolt (kv) line from Sigurd, Utah, to Fort Churchill, Nevada, cuts across the extreme southern portion of the area. A newly constructed 345 kv line (Intertie #2) initially energized at 120 kv, extends from the Tracy power plant to the Oreana substation north of Lovelock, Nevada. The Applicant has applied to the BLM for a right-of-way to extend this line from Oreana, through the North Valmy site, to Hunt, Idaho. (Oreana-Hunt Final Environmental Statement, 1977.)

Southwest Gas Corporation owns a natural gas pipeline that crosses northern Nevada in a northeasterly to southwesterly direction, passing close to Oreana, and generally paralleling the Tracy-Oreana transmission line.

Recreation

Environmental Statement Area

Outdoor recreation resources and visitor activities within the plant site, transmission line Segments A through D, and Segment G were analyzed from data in the Battle Mountain, Elko, and Winnemucca Bureau of Land Management (BLM) District Offices' Recreation Inventory System (RIS). Primary sources for visitor use figures were the 1977 Nevada Statewide Comprehensive Outdoor Recreation Plan, and Water for Nevada, Volumes 6 and 7.

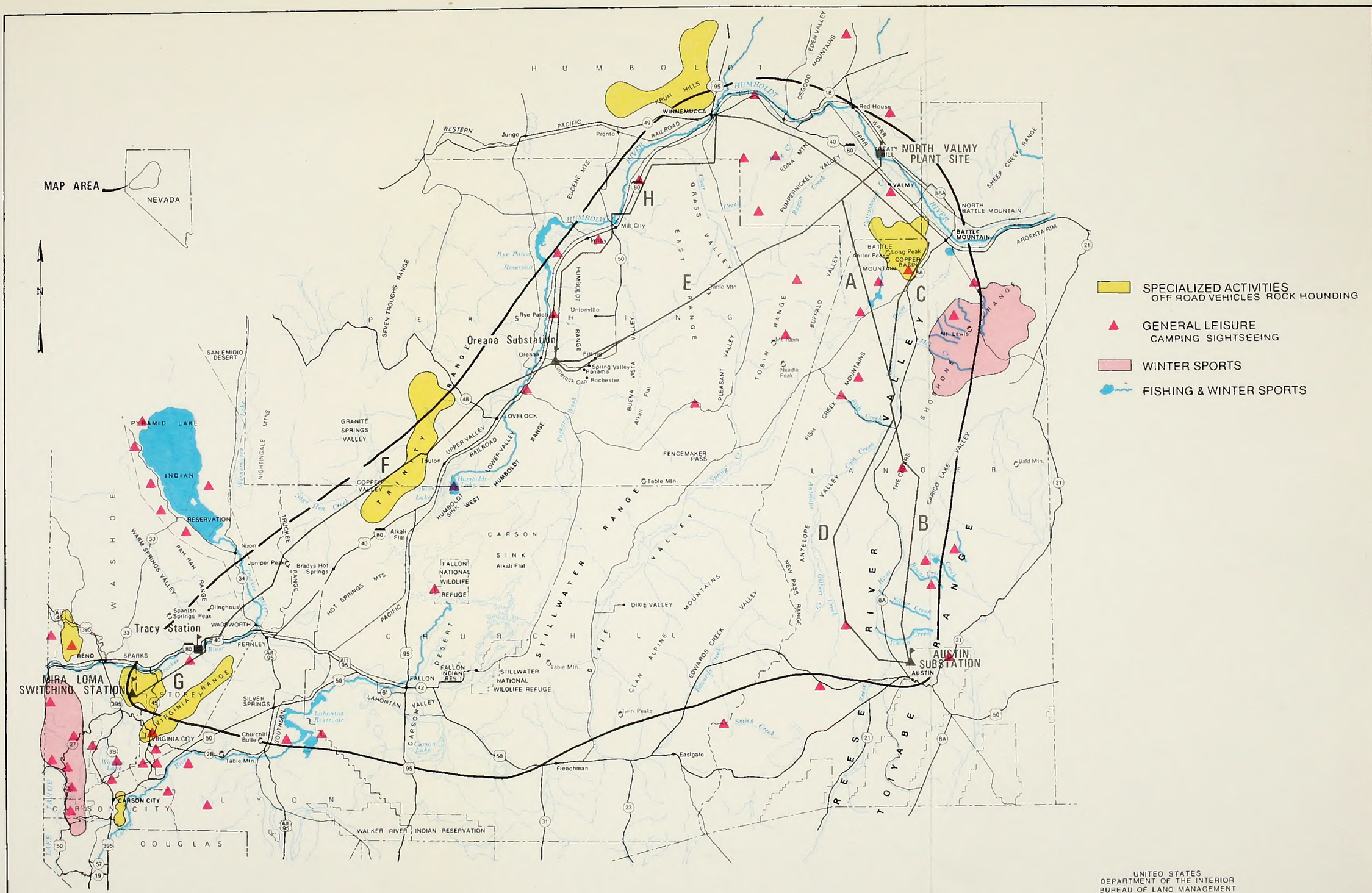
Transmission line Segments E, F, and H have been previously described in the Tracy to Oreana Environmental Analysis Record and the Oreana-Hunt Final Environmental Statement, and were not included in the outdoor recreation analysis for the Valmy Draft ES. The Recreation Values Map, p. 2-57 , depicts the significant attractions throughout the Valmy project influence zone, including some previously analyzed in the documents cited above.

The RIS showed most outdoor recreation values of the ES area to be directly related to extensive undeveloped natural desert and mountain environment areas that furnish scenic beauty, fisheries or wildlife habitats, and unrestricted open space. General sightseeing, in conjunction with driving for pleasure, is the primary recreation use identified in the ES area in terms of numbers of participants. Upland game bird and mule deer hunting, four-wheel drive or "off-road" vehicle trips, stream fishing, sightseeing of historic areas or natural features, rockhounding, and recreational prospecting are also popular activities.

Power Plant Complex

Recreation uses in the power plant complex area are limited primarily to hunting, sightseeing, "off-road" vehicle (ORV) use, fishing, furbearer trapping, rockhounding, and general leisure activities such as pleasure driving and relaxing outdoors.

BLM manages 3,392 acres or about 25 percent of the 13,640-acre project site for public recreation. About 10,240 acres of the site are privately owned, where landowners' permission is necessary for recreational use.



UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

NORTH VALMY POWER PROJECT

RECREATION VALUES

1977

Although the Humboldt River marshes and 276 irrigated acres comprise only about 20 percent of the site (2,644 acres; all private), these wetland environments provide most of the outdoor recreation opportunities commonly associated with desert valleys in north-central Nevada.

Stands of willow and irrigated fields provide some deer, pheasant, quail, waterfowl, dove, and rabbit hunting opportunities. The Humboldt River supports some bass, catfish, bluegill, and crappie; however, that segment within the project site is not considered popular for fishing (Water for Nevada: Report No. 6, 1973).

The project site is not used for organized ORV events, but motorcycles, four-wheel drive vehicles, light trucks, and other specialized recreation vehicles are driven throughout the North Valmy area to gain access to other recreation activities.

Transmission and Communications Systems

The proposed Valmy-Austin corridors would not directly cross through any established recreation facilities. Several popular, unimproved sightseeing, hunting, fishing, and other leisure activity sites would be within view of the proposed transmission line alternative routes. Visitors to the destinations discussed in this section would have to cross under the transmission line within one-half to two miles of popular day-trip sites in most cases.

During 1975, hunting and fishing accounted for about 16,000 of the estimated 19,000 recreation visitor days attributed to the Battle Mountain BLM District's Shoshone Planning Area, within which the Valmy-Austin transmission line alternatives are located. (USDI, BLM, Shoshone Planning Area Analysis (Draft), 1976.)

Segment A would cross Willow Creek near Willow Creek Reservoir, site of a Duval Mining Company park development. Segment B would parallel State Route 8 between the highway and the northern end of the Toiyabe Range, an area with significant sightseeing, fishing, hunting, and primitive values. Hall Creek, Iowa Creek, Iowa Canyon Reservoir, Boone Creek, and Silver Creek all provide public trout fishing, camping, and picnicking opportunities at unimproved streamside sites.

Segment C crosses access routes leading from State Route 8A into the east and south sides of Battle Mountain, a desert mountain system containing several rockhounding areas and historic townsites. Mt. Lewis and the northern Shoshone Range offer some of the highest-rated sightseeing and primitive recreation opportunities within the area affected by the alternative routes.

Very few organized off-road vehicle outings have been known to occur in the Valmy-Austin area; these are generally done in conjunction

with fishing or hunting trips by local sportsmen. Camping and picnicking are believed to take place as secondary activities on fishing, hunting, or rockhounding trips, and do not appear to be significant in terms of numbers of users. (USDI, BLM, Shoshone Planning Area Analysis. Unpublished draft, 1976.)

Wilderness

Section 603(a) of the Federal Land Policy and Management Act of 1976 (FLPMA) (Public Law 94-579) requires the Secretary of the Interior to review public land roadless areas and roadless islands of 5,000 acres or more identified as having wilderness characteristics described in the Wilderness Act of September 3, 1964 (78 Stat. 890; 16 USC 1131 et. seq.) and to report to the President his recommendation as to the suitability or nonsuitability of each Wilderness Study Area for preservation as wilderness. The definition of wilderness characteristics as used by the BLM to inventory the public lands is contained in Section 2(c) of the 1964 Wilderness Act, as follows:

> A wilderness, in contrast with those areas where man and his own works dominate the landscape, is hereby recognized as an area where the earth and its community of life are untrampled by man, where man himself is a visitor who does not remain. An area of wilderness is further defined to mean in this Act an area of undeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions and which (1) generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable; (2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation; (3) has at least five thousand acres of land or is of sufficient size as to make practicable its preservation and use in an unimpaired condition; and (4) may also contain ecological, geological or other features of scientific, educational, scenic, or historical values.

Preliminary results of a study of public lands within five miles of the proposed project indicate that the plant site area and transmission line corridor Segments A, C, D, F, and G would not directly impact any public land islands or roadless areas with wilderness characteristics.

Corridor Segment B would traverse The Cedars, a scenic pass through the Shoshone Mountains which contains an unpaved county road. The BLM Battle Mountain District Office's outdoor recreation resource inventory identified about 25,000 acres in this area as having "primitive values" equivalent to the wilderness characteristics described in the 1964 Wilderness Act. (USDI, BLM, Recreation Inventory for the Shoshone Planning Area, 1976.)

Corridor Segments E and H (Valmy-Oreana alternatives) have been previously described in the Oreana-Hunt Final Environmental Statement (INT FES 77-52, p. 1-8). A wilderness resource inventory of Segments E and H will be conducted prior to granting a right-of-way for the proposed Oreana-Hunt 345 kv transmission line, portions of which would parallel the Valmy-Oreana segments of this proposed project.

The BLM has proposed wilderness policy and review procedures which requires public participation in establishing wilderness review criteria. Comments pertaining to potential Wilderness Study Areas discussed in this ES, as well as those comments received through BLM wilderness review program hearings, workshops, meetings, or correspondence will be incorporated into the wilderness analysis scheduled for completion prior to publication of the Final ES on this proposed action. A report on the wilderness inventory and analysis will be available upon request at that time from the BLM State Office in Reno, Nevada.

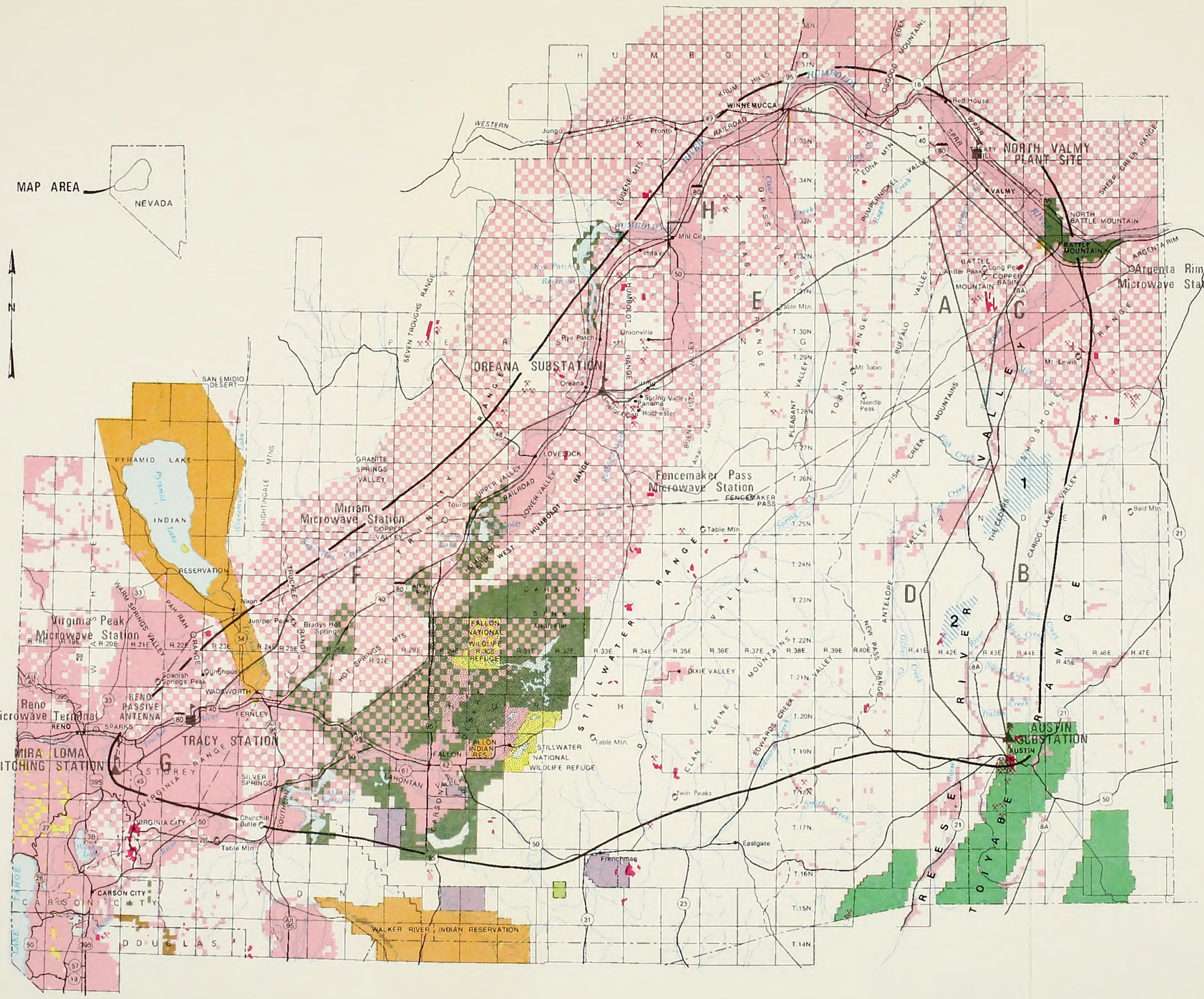
Table 2-33 lists the potential Wilderness Study Areas that appear to have wilderness characteristics and are anticipated to require further review. These areas may be subject to future modification as the wilderness analysis progresses. The Potential Wilderness Study Area Map, p. 2-63 , depicts the locations of these areas in relation to the components of the proposed action.

TABLE 2-33
POTENTIAL WILDERNESS STUDY AREAS WITHIN FIVE MILES OF PROPOSED VALMY-AUSTIN TRANSMISSION LINE CORRIDORS

Potential wilderness study area name	Total acres[a/]	Acres affected by proposed corridors[b/]	Corridor segment	Miles of corridor affected
Cedars-Elephant Head	25,000	12,800	B	16
Manhattan Mountain	9,600	3,500	D	11
Total	34,600	16,300		27

a/ Adapted from the primitive values analysis, Recreation Inventory System - Shoshone Planning Area, BLM Battle Mountain District, 1976. These areas are the areas subject to further analysis for the Final Environmental Statement. Appendix F contains inventory and analysis data on areas listed.

b/ The affected area is the five-mile radius within which aluminum guyed delta towers or surface clearings for roads or other facilities are expected to create a visual intrusion of such magnitude that they might result in a judgment that the affected portion of a roadless area would not meet the Wilderness Act definition.



PUBLIC LANDS

- PUBLIC LANDS
- NATIONAL FOREST
- BUREAU OF RECLAMATION WITHDRAWALS
- DEPARTMENT OF DEFENSE FACILITIES
- ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION
- FEDERAL WILDLIFE REFUGES
- FEDERAL WILDLIFE MANAGEMENT AREAS

PRIVATE LANDS

- INDIAN RESERVATIONS
- INDIAN TRUST ALLOTMENTS
- PRIVATE LANDS
- PATENTED LODE MINING CLAIMS

POTENTAIL WILDERNESS STUDY AREAS

1. CEDARS — ELEPHANT HEAD
2. MANHATTAN MOUNTAIN

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

NORTH VALMY POWER PROJECT

POTENTIAL WILDERNESS STUDY AREA

1977

Wilderness Study Areas will not contain roads meeting the definition contained in BLM Organic Act (FLPMA) directive 77-71, change 1, dated December 28, 1977:

Road: An access route which has been improved and maintained by using hand or power machinery or tools to insure relatively regular and continuous use. A way maintained solely by the passage of vehicles does not constitute a road.

Words and phrases used in the above definition of a road are defined as follows:

Improved and maintained: Where actions have been and will continue to be directed to physically keep the road open to traffic.

Relatively regular and continuous use: Use by vehciles having four or more wheels which has occurred and will continue to occur on a re-curring basis, for a predetermined, planned, or intended purpose. An example would be access for equipment to maintain a stock water tank. Casual or random use by off-road vehicles or recreationists does not qualify.

Cultural Values

Paleontological Resources

Paleontological resources occurring in the central Nevada region include prehistoric faunal, floral, and trace fossils. The basic components are invertebrate (worms, shells, etc.), vertebrate (reptiles and mammals), and paleo-botanical (plant) fossils. Invertebrate fossils are more common to the ES area than vertebrate fossils. According to the Museum Director, Mackay School of Mines at the University of Nevada, Reno, there appear to be no important paleontological resources in the ES area.

Archaeological Resources

Environmental Statement Area. Several possible transmission corridors were evaluated through an extensive literature search, and the probability of encountering archaeological resources along these routes has been assessed. (See Section 10 of the Applicant's Environmental Report, and the ES Area Cultural Resources Map, p. 2-67 .) The Segments, E, F, and G between Tracy, Nevada, and Valmy, Nevada parallel a route which has been intensively inventoried (Rusco and Seelinger, n.d.; Seelinger, 1976). Most of these segments pass through areas which include a low density of small archaeological sites. Higher site densities and larger sites were found along the Truckee River in the Pyramid Lake Indian Reservation, along the Humboldt River, and in the Sacramento Canyon area. The primary significance of these archaeological sites lies in their potential contribution of scientific data.

Inventory data are lacking for the Limerick Canyon alternative along Segment E and for most of Segment H. Archaeological site densities in Limerick Canyon are probably equivalent to those in Sacramento Canyon. More sites may have already been destroyed or damaged in Limerick Canyon, however, since it has sustained considerably more modern use. Along Segment H low site densities are expected on alluvial fans, but there is strong potential for major archaeological sites in areas near the Humboldt River.

Inventory data for the Valmy to Austin segments are also very sparse and predictions of site densities in this area are based upon current perceptions of Great Basin settlement patterns (Applicant's Environmental Report). Major sites are expected in pinyon-juniper areas in the Shoshone Range (Segment B). Moderate site densities are predicted for areas along the Reese River (Segments C and D), terraces at the eastern foot of Battle Mountain (Segment C), and along the well-watered base of the Toiyabe Range near Austin (Segment B).

Low site densities and relatively minor sites are expected in Buffalo Valley and along the western slopes of Battle Mountain (Segment A).

MAP AREA

NEVADA

N

POTENTIAL FOR ARCHEOLOGICAL RESOURCES

- HIGH
- MEDIUM
- LOW
- HISTORICAL RAILROADS
- NATIONAL REGISTER PROPERTIES
- HISTORICAL TOWNS AND MINING CLAIMS

NORTH VALMY PLANT SITE

Oreana Substation

Tracy Station

MIRA LOMA SWITCHING STATION

AUSTIN SUBSTATION

A B C D E F G H

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17

HUMBOLDT · PERSHING · CHURCHILL · LYON · STOREY · WASHOE · DOUGLAS · CARSON CITY

WINNEMUCCA · Red House · Jungo · Pronto · Mill City · Imlay · Unionville · Rye Patch · Oreana · Fillmore · Spring Valley · Panama · Rochester · Table Mtn. · Mt Tobin · Needle Peak · Mt. Lewis · Bald Mtn. · Long Peak · Battle Mtn. · Argenta · Valmy · Lovelock · Touton · Humboldt Sink West · Fencemaker Pass · Granite Springs Valley · Pyramid Lake · Indian Reservation · Nixon · Juniper Peak · Bradys Hot Springs · Alkali Flat · Fallon National Wildlife Refuge · Stillwater National Wildlife Refuge · Fallon Indian Res. · Fallon · Lahontan Valley · Lahontan Reservoir · Silver Springs · Virginia City · Churchill Butte · Spanish Springs Peak · Olinghouse · Wadsworth · Fernley · Sparks · Reno · Carson City · Walker River Indian Reservation · Dixie Valley · Eastgate · Frenchman · Twin Peaks · Austin

Humboldt River · Rye Patch Reservoir · Truckee River · Carson River · Lahontan Reservoir · Carson Lake · Stillwater · Table Mtn. · Smith Creek · Edwards Creek · Reese River · Toiyabe Range · Cortez Range · Shoshone Range · Cargo Lake Valley · Buena Vista Alkali Flat · Pleasant Valley · Fish Creek Mountains · Antelope Valley · New Pass Range · Clan Alpine Mountains · Sheep Creek Range · Battle Mountain · Copper Basin · Pumpernickel Valley · Grass Valley · Buffalo Valley · Tobin Range · Seven Troughs Range · Humboldt Range · Eugene Mts. · Osgood Mountains · Eden Valley · Krum Hills · Western Pacific Railroad · Interstate Railroad · Spar Ward · Hot Springs Mts. · Pah Rah Range · Warm Springs Valley · San Emidio Desert · Nightingale Mtns · Granite Springs Valley · Lovelock Range · Humboldt Range · Virginia Range · Carson Sink · Carson Desert

10 0 10 20 30 40 MILES

10 0 10 20 30 40 50 KILOMETERS

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

NORTH VALMY POWER PROJECT

CULTURAL RESOURCES

1977

A low site density is also predicted on alluviated areas in Antelope Valley (Segment D), although more cultural material is expected in the pinyon-juniper ecotone on the western slopes of the Shoshone Range and above Gilbert Creek. Potentials for archaeological resources are shown on the Cultural Resources Map, p. 2-67 . As was the case for the Tracy to Valmy portion of this proposed transmission system, scientific potential of sites which may occur along the transmission line route will probably be their primary value. While these potentials appear reasonable, they are also very general, and would be primarily useful during the early planning stages of the proposed project. The Applicant is aware of the fact that full assessment of archaeological resources affected by the selected transmission corridors would only be possible after a specific route had been selected and intensively inventoried.

Archaeological resources in the vicinity of the proposed communciations facilities have not yet been considered.

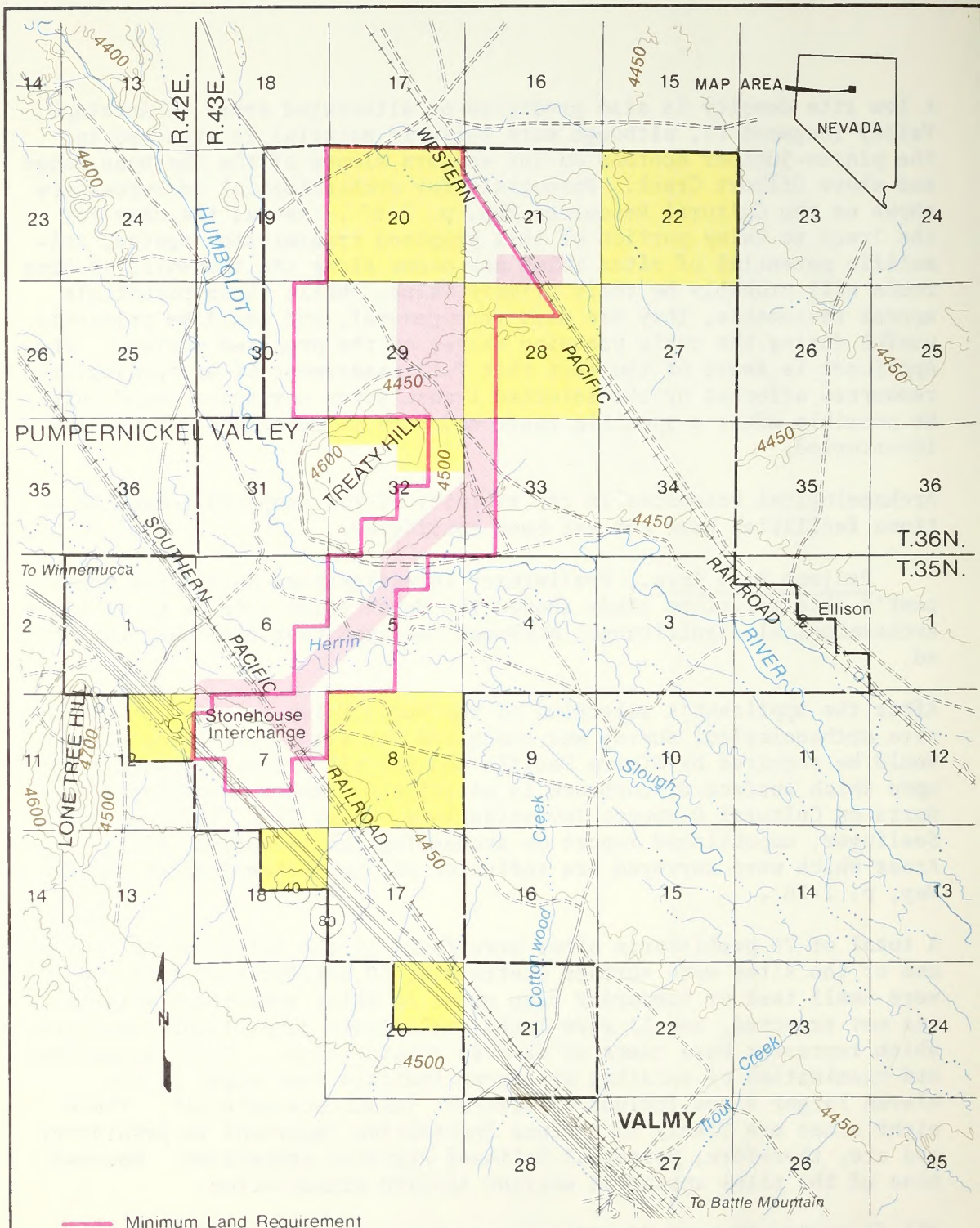
Project Site Area. Preliminary investigations during the Applicant's site selection study showed the North Valmy site to be of minor archaeological significance, although one important base camp was noted.

After the Applicant's selection of the North Valmy location an intensive archaeological survey was conducted for all public lands which would be acquired by Sierra Pacific and for all privately owned lands upon which surface disturbance is anticipated (Rusco, unpublished reports on Cultural Resource Investigations, Valmy Site, 1975 and 1976; Seelinger, unpublished report on archaeological resources, 1977). Areas which were surveyed are indicated on the Archaeological Survey Map, p. 2-70 .

A total of 76 prehistoric sites were found in the survey area. Fifty-one of the sites were surface scatters of 20 artifacts or less, 14 were small task or temporary camp sites in which subsurface material was not expected, and 11 were large, relatively dense lithic scatters which represent base camps or favored camping sites. Test excavations and examination of existing exposures indicate that eight of the eleven larger sites include significant subsurface material. These eight sites are likely to produce information important in prehistory and are, therefore, potential National Register properties. However, none of the sites appear to warrant in-situ preservation.

All 51 small sites of 20 artifacts or less were collected during the survey. In addition, one of the larger sites has been surface collected and two other larger sites have been surface collected and excavated (Davis, Fowler, and Rusco, 1976). These sites were located on private land and investigations were limited strictly to portions of the three sites which would be disturbed by road and railroad construction.

Results of these studies indicate the area was exploited by aboriginal populations as much as 7,000 years ago. Archaeological resources from



UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

NORTH VALMY POWER PROJECT
ARCHAEOLOGICAL SURVEY

1977

the project area promise to yield information about prehistoric land use patterns and subsistence strategies.

The potential of the entire assemblage of archaeological sites is enhanced by the presence of eight sites which include subsurface material. These sites may well include paleo-environmental information, as well as carbon suitable for radiocarbon dating.

Historic Resources

Known historic sites falling within the three-mile wide corridor along the alternative power transmission routes have been identified through a literature search (Applicant's Environmental Report; Paher, 1970; Mordy and McCoughey, n.d.; Browne, 1972; Hand, 1974; Myrick, 1962). These sites are identified on the Cultural Resources Map, p. 2-67 .

The Humboldt River was a popular route for early explorers in the Great Basin. Peter Ogden traveled along the Humboldt River in 1828-29 and later expeditions included those of Joseph Walker and Jedediah Smith. No trace of these routes remains today.

Beginning in 1841 the Humboldt River became a major route for early California emigrants. Although traces of the original trails can still be discerned in some areas, those portions which fall within the power transmission corridors have been obliterated by natural erosion and human activity.

In 1859 Captain Simpson surveyed a new route across central Nevada which passed through or near Emigrant Pass immediately west of Austin substation. This route was later used by both the Overland Mail and the Pony Express.

Between Tracy and Oreana, Segment F passes near Olinghouse (1)[a/], in the Pah Rah Range. This is a late 1800s-early 1900s silver mining town. Several wooden buildings remain on the site. Also nearby are traces of the Nevada Railroad (2), built in 1906 to serve Olinghouse. Along the Humboldt River near Oreana are two historic settlements. The original site of Oreana (3) was settled as a mill camp in 1866 and abandoned in the 1870s. Foundations, slag piles, and caved-in cellars remain at these sites. Oreana Station (4), present day Oreana, grew up around a Southern Pacific Railroad siding and station house, seeing peak activity in 1910. This community was also the western terminus of the Nevada Short Line Railroad (5), a narrow guage railroad which served the Rochester area from 1913 until 1918. In the Humboldt Range along Segment E, the power transmission corridor includes Lima (6), Panama (7), and Fitting or Spring Valley (18). These sites were mining camps occupied from the 1860s until 1910. A stone

---

a/ Numbers refer to corresponding numbers on the Cultural Resources Map.

cabin remains at Lima and several wooden structures are still standing at Fitting.

Segment H, along the Humboldt River, passes near Rye Patch (9), another small mining camp active between 1864 and the late 1880s. Only mill foundations remain. Mill City (10), was an important mining town established in 1862, although it has seen only sporadic activity since the 1870s. Golconda (11), was settled in 1866 and still boasts a small population. Golconda was also the northern terminus of the Golconda and Adelaide Railroad (12), which was completed in 1899 and finally abandoned in 1910.

Between Valmy and Austin, Segment A includes Copper Basin (13), Old Battle Mountain (14), and Bannock (15). These three mining camps were active at various times between the 1870s and the 1930s. A few wooden buildings remain at Copper Basin. Segments B, C, and D also cross or pass near the bed of the Nevada Central Railway (16), which was built in 1879-80 and served Austin for 58 years. Segment D includes Skookum (17), an early 1900s mining camp marked by a single frame building.

National Register Properties

Review of the Federal Register through May 21, 1977, and consultation with the Nevada State Park System indicate that there are no National Register properties within the plant site area and proposed transmission line corridors. Two National Register or National Register-eligible properties occur near the proposed corridors, however.

The Austin Historic District, which is listed on the National Register of Historic Places is located a mile and a half south of the transmission line terminus.

The Rochester Historic District is located in the Humboldt Range one and a half miles south of the proposed transmission line. This area is on the Nevada State Office of Historic Preservation priority list for nomination to the National Register of Historic Places.

Visual Resources

The visual resource of an area is defined as the unique combination of visual features, i.e., land surface, vegetation, and structures. The relationships between visual features (expressed in terms of the basic visual elements of form, line, color, and texture) provide all landscapes with an identifiable character.

An analysis of the landscape character in the ES area reveals a strong contrast between the horizontal expanse of the desert valley floor and the adjacent rugged foothill and mountain landforms. Color and texture contrasts are evident in the diverse vegetation associations at different elevations and in the unique surface deformations of the exposed topography. These patterns of light-to-dark and fine-to-coarse form linear patterns across the landscape which are most evident when viewed from higher elevations. At the lower elevations the shadscale vegetation and the light colored dry lake beds contrast with the grey-green sagebrush. Similarly the coarse texture of the rugged rock outcrops and the dark pinyon-juniper associations are visually apparent. Occasional marshes and the green vegetation of the Humboldt and Reese River basins also add to the color-texture changes.

Man-made intrusions tend to contrast greatly with the overall visual character of the natural landscape. Several existing intrusions within the ES area which are visually apparent are:

- the Interstate 80 (I-80) and Highway 8A corridors including their associated billboards, roadside developments, and communities;

- the transmission lines parallel to I-80 and the 230 kv line and substation just north of Austin;

- the numerous roads, jeep trails, and fence lines associated with transmission lines, mining operations, ranching, and other activities; and

- the straight-line railroads and railroad beds.

All of these activities fail to borrow from the naturally established form, line, color, and texture.

Ranch developments are located at the north entrance to Antelope Valley and in the foothills of the Toiyabe Range. However, their impacts generally remain subordinate to the existing landscape character.

The most visible man-made intrusions are those associated with mining activities in the Battle Mountain and South Shoshone Mountain range. The exposed subsurface soils contrast with the natural colors, causing the scars and cuts in the hillsides to visually dominate the adjacent landforms.

The goal of BLM's visual resource management is to reduce the contrast of existing and future man-made intrusions on the environment. Therefore, visual management classes were outlined for the ES area according to the evaluation systems described in Bureau of Land Management (BLM) Manual 6300. This manual is available to the public at all BLM Offices throughout the State, and it is suggested that this analysis be reviewed in order to understand the basic criteria and methodology of the visual resource and evaluation system.

Classes II, III, and IV are the only classes apparent in the ES area and are illustrated on the Visual Resource Map, p. 2-75 . They are as follows:

Class II

Class II identifies highly significant visual resource areas (high sensitivity levels and important scenic values). Those areas rated highly significant within the ES area are the North Shoshone Mountain range, including the Cedars and Narrows; the mid Reese River Valley; the Iowa and Italian Creek watersheds in the Toiyabe Mountain range; the geologically unique White Sage Rock Canyon; and Mt. Moses in the Fish Creek Mountains.

Class III

Class III areas, although not as important as Class II, are still considered moderately significant because of their critical visual resource values. Class III areas within the ES area have been identified as the southern Reese River Valley; a portion of the Shoshone Mountain range north of the Narrows visible from Highway 8A; the southwest corner of Carico Lake Valley; the Reese River Wastes; Long and Antler Peaks on Battle Mountain; and the foreground-middleground zones visible from Battle Mountain.

Class IV

The majority of the ES area is of lower sensitivity and scenic value and is included in visual resource Class IV. Some of these areas are the Buffalo, Antelope, Carico, and the northern portion of the Reese River Valley. These areas are designated Class IV because they have little variation in topography and vegetation and because of the lack of scenic water features. Battle Mountain, the Fish Creek Mountains, and the Southern Shoshone Mountains are also within Class IV due to the degrading effect of mining and other man-made intrusions.

MAP AREA

NEVADA

N

CLASS 2

CHANGES IN ANY OF THE BASIC ELEMENTS (FORM, LINE, COLOR OR TEXTURE) SHOULD NOT BE EVIDENT IN THE MANAGEMENT ACTIVITY

CLASS 3

CHANGES IN THE BASIC ELEMENTS MAY BE EVIDENT IN THE MANAGEMENT ACTIVITY

CLASS 4

CHANGES MAY SUBORDINATE THE ORIGINAL COMPOSITION & CHARACTER BUT MUST REFLECT WHAT COULD BE A NATURAL OCCURRENCE WITHIN THE CHARACTER TYPE

MILES 10 0 10 20 30 40

KILOMETERS 10 0 10 20 30 40 50

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

NORTH VALMY POWER PROJECT

VISUAL RESOURCE MANAGEMENT CLASSES

1977

Social-Economic Conditions

Service Area

Sierra Pacific's Service Area encompasses all or part of 12 Nevada counties and portions of seven California counties along Lake Tahoe. The major load centers include the Reno-Sparks area, Carson City, and Lake Tahoe. (See the Service Area Map, p. 1-2 .)

The population census for 1970 estimated 229,884 persons within the selected Service Area counties. These figures are shown in Table 2-16, p. 2-78. (Sierra Pacific does not service the entire population of many of the seven California counties; therefore, subdivisions within individual counties were selected to represent the approximate population base for which Sierra Pacific provides electrical energy. (Refer to Table G-3, p. 10-51 , for a list of counties and their selected subdivisions.)

By 1975, population was estimated at 290,972. Increases over the five year period were 27 percent, with an annual growth rate of 4.83 percent.

The prevalent limitation to population growth within the Service Area is water-related. Population growth is of real concern to residents of Washoe County as illustrated by a Blue Ribbon Committee Report (1974), and the May 1976, defeat of a sewage disposal bond which has since been passed.

Nevada established gaming as a legal enterprise in March 1931 (Assembly Bill 98, Nevada Revised Statutes), creating a viable new economic sector in a then declining economy. Because of the unique geographic features of the northern Sierra Nevada, the area has become a haven for recreation activities and the gaming-entertainment industry. Large population centers in northern California, the Northwest, and many Rocky Mountain states help support these industries of northern Nevada and Lake Tahoe.

In 1975, the service industry sector made up 36 percent of total employment in the Sierra Pacific Service Area. (See Table 2-17, p. 2-79 .) Within the Reno Standard Metropolitan Statistical Area (SMSA), nearly 57 percent of the work force is employed in the trade and service sectors. (See Table 2-18, p. 2-79 .)

Environmental Statement Area

This section deals with social and economic factors of Humboldt and Lander Counties. Additional social economic information pertaining to the rest of the ES area is contained in the Oreana-Hunt Final Environmental Statement (1977).

TABLE 2-16

SIERRA PACIFIC POWER COMPANY
SERVICE AREA POPULATION 1970-1975

State/County	1970	1975	Percent change
California:[a/]			
Alpine	484	600	24
El Dorado	14,919	20,141	35
Mono	4,016	7,600	89
Nevada	2,528	3,261	29
Placer	14,976	17,372	16
Plumas	2,759	3,311	20
Sierra	2,365	2,600	10
Nevada:[b/]			
Carson City	15,468	27,622	79
Churchill	10,513	12,027	14
Douglas	6,882	10,285	49
Esmeralda	629	862	37
Humboldt	6,375	7,161	12
Lander	2,666	3,281	23
Lyon	8,221	10,305	25
Mineral	7,051	6,769	- 4
Nye	5,599	6,400	14
Pershing	2,670	2,674	0
Storey	695	959	38
Washoe	121,068	147,747	22
Total	229,884	290,972	27

a/ California Statistical Abstract, 1975.

b/ Bureau of Business and Economic Research, University of Nevada, Reno. Revised March 1977.

TABLE 2-17
ESTABLISHMENT-BASED INDUSTRIAL EMPLOYMENT
SIERRA PACIFIC POWER COMPANY SERVICE AREA - 1975

Industry	Nevada	California[a/]	Total[a/]
Mining	2,720	51	2,771
Contract construction	5,390	952	6,342
Manufacturing	6,780	1,296	8,076
Transportation and public utilities	6,790	1,046	7,836
Trade	21,590	3,245	24,835
Finance, insurance, and real estate	4,710	762	5,472
Service industries	42,620	2,875	45,495
Government	23,180	1,033	24,213
Total	113,780	11,677[b/]	125,457[b/]

a/ Some counties omitted data to avoid disclosure of confidential information.
b/ Column total will not add due to omitted data.
Source: State of Nevada, Employment Security Department. Nevada Annual Planning Report, 1976.

TABLE 2-18
RENO SMSA ESTABLISHMENT-BASED INDUSTRIAL EMPLOYMENT--1975

Industry	People employed
Mining	400
Construction	3,700
Manufacturing	4,800
Transportation, communications, public utilities	5,600
Trade	16,300
Finance, insurance, and real estate	3,900
Services	26,300
Government	13,100
Total	74,100

Source: State of Nevada, Employment Security Department. Nevada Annual Planning Report, 1976.

Population Characteristics. Humboldt County's population estimate in 1970 was 6,375 persons. By 1975 population had increased to 7,161. This represents a 12 percent increase in the five year period, reflective of the 23 percent growth in population for the State of Nevada as a whole during the same time span.

In 1975, population estimates showed the City of Winnemucca with 3,974 residents; the rural area immediately surrounding Winnemucca with 1,349. (See Appendix Figure G-1, p. 10-58.) Humboldt County is considered a rural area due to the predominance of public lands under federal control.

Lander County had an estimated population of 2,666 persons in 1970. By 1975, the population had risen to 3,281. This represents a 23 percent population increase for the State of Nevada over the same five year period.

Battle Mountain is the single largest community within Lander County, with a 1970 population estimate of 2,236. Lander County, like Humboldt County, is considered rural. (See Appendix Figure G-2, p. 10-59.)

Two Indian colonies are included in the ES area. The Winnemucca colony was established in 1917 for Shoshone and Paiute Indians. Current (1976) population is approximately 35. This colony is governed by a five member council, and is a member of the Intertribal Council of Nevada.

The Battle Mountain colony is made up of Shoshone Indians and was also established in 1917. The 1976 population was 165. This colony is governed by a six member council, and is also a member of the Intertribal Council of Nevada.

Employment Characteristics. Employment in Humboldt County is concentrated in the service and trade industries. Government and agriculture also provide a substantial source of employment for the region. The mining and finance sectors provide the least number of total employed. Between 1970 and 1974, manufacturing showed an increase in employment of 340 percent, the largest percentage increase. (See Table 2-19, p. 2-81 .)

Humboldt County averaged 5.8 percent unemployment for 1975 while the State of Nevada average was 9.9 percent. This lower level of unemployment is due mainly to the industrial make-up of the communities and to the fact that many of those without jobs seek employment in the more populated areas of Reno and Las Vegas. (See Figure 2-5, p. 2-81 .)

In Lander County the mining industry employed nearly half of all persons in 1974. Government, trade, and agriculture were the other major employers during this same period. (See Table 2-20, p. 2-82 .)

TABLE 2-19
EMPLOYMENT BY INDUSTRIAL SECTOR, HUMBOLDT COUNTY
1970 AND 1974[a/]

Industrial sector	Employment[b/] 1970	1974	1974/1970 Percent increase	1974 Percent total
Agriculture	430	420	- 2	13
Mining	180	50	-72	2
Construction	100	230	130	7
Manufacturing	50	220	340	7
Transportation and public utilities	150	220	47	7
Trade	560	710	27	21
Finance, insurance, and real estate	40	40	---	1
Services	470	750	60	23
Government	520	550	6	17
Unemployment	71	120	69	3.6
Total	2,571	3,310	29	

a/ Source: State of Nevada, Employment Security Department. County Labor Force Summary: 1970 and 1974.

b/ Numbers are rounded to the nearest ten.

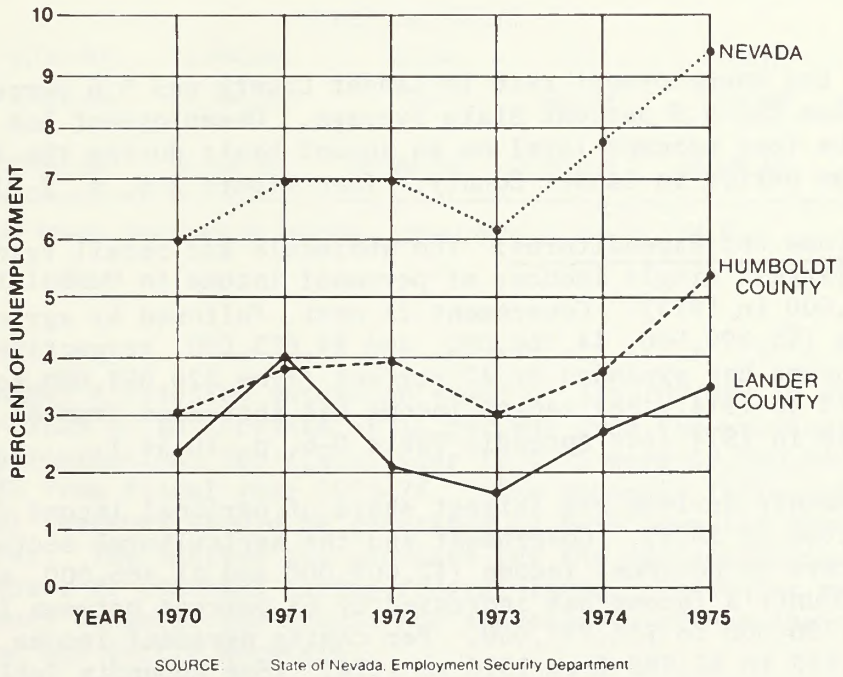


FIGURE 2-5 — ANNUAL AVERAGE UNEMPLOYMENT 1970-1975

TABLE 2-20
EMPLOYMENT BY INDUSTRIAL SECTOR, LANDER COUNTY
1970 AND 1974[a/]

Industrial sector	Employment[b/] 1970	1974	1974/1970 Percent increase	1974 Percent total
Agriculture	160	150	- 6	11
Mining	450	630	40	45
Construction	c/	40	---	3
Manufacturing	0	0	---	---
Transportation and public utilities	40	50	25	4
Trade	170	210	29	15
Finance, insurance, and real estate	20	10	-50	1
Services	60	50	16	4
Government	190	230	21	16
Unemployment	19	30	58	2.1
Total	1,109	1,400	26	

a/ Source: State of Nevada, Employment Security Department, County Labor Force Summary: 1970 and 1974.

b/ Numbers are rounded to the nearest ten.

c/ Less than 10.

In 1975 the unemployment rate in Lander County was 3.6 percent, much lower than the 9.9 percent State average. Unemployment has not risen above the four percent level on an annual basis during the 1970 and 1975 time period in Lander County. (See Figure 2-5, p. 2-81 .)

Income and Expenditures. The wholesale and retail trade sector is the largest single inducer of personal income in Humboldt County ($5,880,000 in 1974). Government is next, followed by agriculture and services ($5,299,000, $4,766,000, and $4,673,000, respectively). Personal income has expanded by 42 percent (from $20,054,000 to $28,474,000) from 1970 to 1974. Per capita income has increased from $3,753 in 1970 to $5,530 in 1974 (see Appendix Table G-6, p. 10-54).

Lander County derives its largest share of personal income from mining ($8,666,000 in 1974). Government and the agricultural sectors follow as inducers to personal income ($2,603,000 and $1,466,000, respectively). Lander County's income has increased by 63 percent between 1970 and 1974, from $9,706,000 to $15,797,000. Per capita personal income, has risen from $3,855 to $5,989 from 1970 to 1974. (See Appendix Table G-7, p. 10-55 .)

Government Finance and Taxation. Assessed valuation for Humboldt County was $51,080,492 for fiscal year 1975-76. This represents a 15 percent increase over the previous fiscal year's valuation. (See Appendix Table G-4, p. 10-52 .)

Assessed valuation for the City of Winnemucca increased by 10 percent from $12,166,588 in fiscal year 1974-75 to $13,333,477 in fiscal year 1975-76. By State authority the rate of taxation cannot exceed five percent of the assessed valuation; this includes local, county, regional, and State taxing bodies with the exception of special tax districts. By design, revenues generated come from assessments rather than by changing the rate of taxation. For fiscal year 1974-75, $6,215,576 was appropriated for the purpose of providing services for the people within Humboldt County. This was a 15 percent increase over the previous fiscal year. (See Table 2-21.)

TABLE 2-21
LOCAL GOVERNMENT APPROPRIATION FUND REQUIREMENTS

County	County	School	Cities	Towns	District	Total
			Fiscal year 1974-75			
Humboldt	2,693,395	2,396,630	761,852	-0-	363,699	6,215,576
Lander	1,419,525	1,199,612	-0-	309,899	161,448	3,090,484
17 counties total	115,445,809	167,604,947	92,071,004	11,991,126	20,708,815	407,821,701
			Fiscal year 1973-74			
Humboldt	2,133,862	2,368,056	655,801	-0-	259,196	5,426,915
Lander	1,122,483	1,264,512	-0-	369,136	418,088	3,174,219
17 counties total	99,041,332	156,304,591	89,580,719	10,325,473	21,408,863	370,660,978

Source: State of Nevada, Department of Taxation. Annual Reports 1973-74, 1974-75.

Lander County's assessed valuation stood at $26,100,000 in fiscal year 1975-76. This is an increase of 11 percent from the previous fiscal year. Appropriations for fiscal year 1974-75 were $3,090,484, a drop of $83,735 from fiscal year 1973-74. (See Appendix Table G-5, p.10-53.) Additional revenues should be generated in both counties through the in-lieu tax. The in-lieu tax provides for the redistribution of federal revenues to counties having federal lands. These tax revenues go to county budgets, and should not appreciably affect the cities of Winnemucca and Battle Mountain.

Housing Characteristics. Housing is generally in short supply throughout the State of Nevada. A high rate of population growth

coupled with the tight housing money market have placed existing available housing at a premium. Rural counties (like Humboldt and Lander) with their stable employment, have high occupancy rates in existing housing with few homes available for sale.

Rentals for all types of housing units are virtually nonexistent in Winnemucca and Battle Mountain as well as in the smaller communities of Golconda and Valmy. Apartment availability is equally lacking in the area. Units in an apartment complex recently built in Winnemucca were being leased prior to ground breaking, which is indicative of the severity of the problem. Construction of additional apartments to satisfy this excessive demand is not anticipated anywhere in the ES area in the near future.

Mobile home sites are also scarce. Only about 60 pads are available for sale in a new park in Winnemucca, with no new mobile home development actively planned. All existing mobile home parks in Battle Mountain are operating at capacity levels with the exception of 18 pads in the Lander Mobile Home Park. This facility, however, is owned and operated by Duval Mining Company and all vacancies are being reserved for potential future expansion and associated incoming employees. A survey of existing housing in the Winnemucca area is contained in Table 2-22.

TABLE 2-22
WINNEMUCCA HOUSING PROFILE
1975

Area and type	1975	Percent
City of Winnemucca		
Single family unit	1,044	67.9
Duplex unit	106	6.9
Apartment unit	150	9.8
Mobile home unit	236	15.4
Total	1,536	100.0
Winnemucca rural		
Single family unit	162	34.9
Duplex unit	2	0.4
Apartment unit	8	1.7
Mobile home unit	293	63.0
Total	465	100.0

Source: Humboldt County, Nevada. "Preliminary Draft: General Plan Background Data for Humboldt County." May 1976.

Education. Humboldt County has seen some fluctuations in student enrollment over the past three school years. There was a total of 1,705 students enrolled throughout the grades (kindergarten through high school) in the 1975-76 school year. (See Table 2-23.) Winnemucca had 1,011 of these students, with 343 at a nearby grammar school. (See Table 2-24, p. 2-86 .) The student-teacher ratio averages 20:1 for Winnemucca Grammar School, 21:1 for West Junior High School, and 22:1 for Lowry High School.

TABLE 2-23
STUDENT POPULATION BY GROUP CLASSIFICATION
HUMBOLDT AND LANDER COUNTIES, 1975-76

School district	Kinder-gartner	Elemen-tary	Secon-dary	Special educa-tion	Total	Percent gain or loss over previous year
			1973-74			
Humboldt	105	799	765	48	1,717	- 1.4
Lander	57	334	334	40	765	8.2
			1974-75			
Humboldt	121	820	813	37	1,791	4.3
Lander	57	389	342	30	818	6.9
			1975-76			
Humboldt	109	742	769	85	1,705	- 5.0
Lander	62	436	357	28	883	7.9

Source: State of Nevada, Department of Education. Research Bulletin. Vol. 18, No. 1. January 1976.

Lander County's school enrollment has continued to increase each of the past three years. (See Table 2-23.) Over 880 students attended schools in Lander County during 1975-76. Most of those students (624) attended schools in Battle Mountain. (See Table 2- 25, p. 2-86 .) The student-teacher ratio averages 25:1 for Mary S. Black School, 23:1 for Eliza Pierce School, and 20:1 for Battle Mountain High School.

Health Services. Winnemucca has the only hospital within Humboldt County. The hospital has 32 licensed beds. There are three doctors on staff, with two additional doctors from outside the area available on a consulting basis. There are five full-time registered nurses and five part-time registered nurses. An additional three licensed practical nurses and 15 aids make up the staff. During 1977,

TABLE 2-24
SCHOOL CAPACITY AND ENROLLMENT,
CITY OF WINNEMUCCA

School	Enrollment	Capacity	Student-teacher ratio	Year school built
Winnemucca Grammar School	223	480	20:1	1928
West Junior High School	349	490	21:1	1954
Lowry High School	439	585	22:1	1967

Source: State of Nevada, Department of Education. Research Bulletin, Vol. 18, No. 1. January 1976.

TABLE 2-25
SCHOOL CAPACITY AND ENROLLMENT,
CITY OF BATTLE MOUNTAIN

School	1975 enrollment	Capacity	Student-teacher ratio	Year school built
Mary S. Black	176	220	25:1	1963
Eliza Pierce	237	300	23:1	1956
Battle Mountain High	211	220	20:1	1962

Source: State of Nevada, Department of Education. Research Bulletin, Vol. 18, No. 1. January 1976.

the hospital had an annual occupancy rate of 50 percent. Additional health care services include an outpatient mental health clinic and home health care. The community also has a public health nurse.

The three staff doctors also have individual practices in the community. Additional medical needs are usually obtained in Reno, Nevada, or Salt Lake City, Utah. A volunteer ambulance service is provided for outlying communities. Three dentists practice in Winnemucca. Currently (1975), there is one physician per 1,331 people in Winnemucca.

Lander County has one 16-bed hospital located in Battle Mountain. There is one doctor on staff, assisted by one paramedic. The nursing staff includes four full-time and three part-time registered nurses,

two licensed practical nurses, three full-time and three part-time aids. In 1977, the hospital has an occupancy rate between 38 and 43 percent. Additional health care services include outpatient mental health care (from Winnemucca), and also home health care provided by a public health nurse.

Battle Mountain has one doctor practicing in the community. There are no dentists. Currently (1975), there is one doctor per 2,236 people in Battle Mountain.

Like Winnemucca, Battle Mountain has a volunteer ambulance service and must rely on Reno or Salt Lake City for technical medical care.

Law Enforcement. Tables 2-26 and 2-27 show the law enformcement personnel and juvenile probation personnel in Humboldt and Lander Counties. Offense and arrest statistics are shown in Table 2-28, p. 2-88 .

TABLE 2-26
LAW ENFORCEMENT MANPOWER[a/]

Agency	Total enforcement personnel	Sworn officers	Civilian
Winnemucca Police Department[b/]	9	9	0
Humboldt Sheriff Office[b/]	13	7	6
Lander Sheriff Office[b/]	12	12	0
Nevada Highway Patrol:[c/]			
Humboldt (Winnemucca)	6	6	0
Lander (Battle Mountain)	3	3	0
Total	43	37	6

a/ Reported as of October 31, 1975.

b/ Identification and Communications Division, Department of Law Enforcement Assistance, State of Nevada.

c/ Applicant's Environmental Report.

Fire Control. The community of Winnemucca has a staff of 18 volunteer firemen and a chief who is paid for his services. Two trucks are available to fight fires within the city, and an additional two trucks are available for rural fires. This group is responsible for fires only on private property within and surrounding the city. The community of Golconda does not have any fire control available. Winnemucca has an average of 40 fires per year and has a Class 6 insurance rating.

TABLE 2-27
LOCAL JUVENILE PROBATION PERSONNEL

Humboldt County:	
Probation Officers	2
Clerical/secretary	1
Total	3
Lander County:	
Probation officers	3
Clerical/secretary	0
Medical counciling	1
Total	4

Source: State of Nevada, Commission on Crime, Deliquency, and Corrections. Comprehensive Criminal Justice Plan, 1977.

TABLE 2-28
OFFENSE AND ARREST STATISTICS FOR
HUMBOLDT AND LANDER COUNTIES[a/]

Offense category	Offenses known to police	Arrests		
		Total	Juveniles	Adults
Murder	2	3	0	3
Rape	2	1	0	1
Robbery	7	9	1	8
Felonious assault	15	11	0	11
Burglary	79	15	2	13
Larceny	162	50	15	35
Motor vehicle theft	28	22	5	17
Sub-total for index offenses	295	111	23	88
Other assaults	N/A	31	2	29
Liquor law violations	N/A	78	27	51
D.U.I.	N/A	112	0	112
Disorderly conduct	N/A	68	0	68
All other offenses	N/A			
Total offenses	N/A	686	128	558

a/ Includes data from Humboldt County Sheriff's Office, Winnemucca Police Department and Lander County Sheriff's Office.

Battle Mountain has 25 volunteer firemen including a chief. The fire department has three trucks available to fight fires within and surrounding the community on private land. The Bureau of Land Management is responsible for all fires on or endangering the public lands. Battle Mountain has an average of 22 fires per year and has a Class 7 insurance rating.

Recreational Activities. There is one theater in Winnemucca, which shows films four nights a week. There are two swimming pools available to the public as well as two tennis courts. Also, a nine hole golf course serves the community. Other social functions revolve around the schools which rely upon community participation.

Battle Mountain does not have a movie theater at this time. Recreational facilities are at a minimum with a single swimming pool available to the public. Other facilities (i.e., gymnasium, football and baseball fields, etc.) are available through the schools.

Attitudes and Expectations. The following is a summary of general public opinions expressed in public documents, publications, letters, and other sources which reflect the attitudes of citizen groups and interested parties. Both the Winnemucca and Battle Mountain Social Economic Profiles (SEP) were used extensively.

The general expressed opinion in central Nevada seems to be that the land should be developed to its fullest potential. There is considerable local sentiment in favor of development for the local economy. Local residents feel economic development would help their income and improve their lifestyle in general. The general feeling is that development should take place and on as broad a base as possible.

There are residents opposed to industrial growth because they do not want the beauty of the lands spoiled and they wish to avoid being crowded by a host of new arrivals.

Urban attitudes (Reno, Sparks, and Carson City), on the other hand, have reflected skepticism toward growth in general in recent years. Residents are more sensitive to factors which accompany growth and are quick to criticize any adverse effects they might associate with any project. A few more jobs and related payrolls are little compensation for the inconvenience of the negative impacts of growth.

FUTURE ENVIRONMENT WITHOUT THE PROPOSED ACTION

Based on estimates for California and Nevada, population within Sierra Pacific's Service Area is expected to increase by 53 percent, with an annual growth rate of 2.16 percent between 1980 and 2000. (See Table 2-29.)

TABLE 2-29
SIERRA PACIFIC POWER COMPANY SERVICE AREA
POPULATION ESTIMATES--1980, 1985, 1990, and 2000

State/County	1980	1985	1990	2000
California[a/]				
Alpine	700	800	900	1,400
El Dorado	23,754	28,157	32,449	38,443
Mono	10,500	13,100	14,900	17,800
Nevada	3,720	4,710	4,670	5,390
Placer	20,805	23,750	26,144	30,001
Plumas	3,696	4,104	4,416	4,944
Sierra	2,700	2,800	3,000	3,400
Nevada[b/]				
Carson City	36,712	44,666	54,343	66,244
Churchill	13,541	15,246	17,166	21,760
Douglas	15,262	18,568	22,591	27,538
Esmeralda	963	1,076	1,204	1,503
Humboldt	8,001	8,706	9,243	10,696
Lander	3,382	3,487	3,594	3,820
Lyon	11,178	12,511	13,671	15,110
Mineral	6,912	7,059	7,208	7,517
Nye	7,330	8,395	9,614	12,610
Pershing	2,692	2,711	2,730	2,768
Storey	1,225	1,414	1,532	1,631
Washoe	189,631	215,418	243,416	283,992
Total	362,704	416,178	472,791	556,567

a/ State of California. California Statistical Abstract, 1975.

b/ University of Nevada, Reno, Bureau of Business and Economic Research. "Revised March 1977 Nevada Population Projections."

The economic life of the proposed power plant and transmission project is expected to be 37 years. Without the proposed action, the projected population and growth rates within Sierra Pacific's Service Area may not be realized. Factors other than electrical power supply may limit population and economic growth within the Applicant's Service Area. These factors could include availability of water, water quality, sewage disposal, land usage (planning and zoning), and changing public attitudes toward growth.

Industrial growth is expected to continue throughout the next decade much the same as it has in the past. The service industry should continue to be the largest employer within the Service Area, as the next several years should see a number of new hotels and casinos opening in the Reno-Sparks area. Manufacturing, which has almost doubled since 1970, should also continue the rapid growth trend, although not generating as many jobs as the service industry. (See Table 2-30.)

TABLE 2-30
RENO STANDARD METROPOLITAN STATISTICAL AREA ESTABLISHMENT-BASED INDUSTRIAL EMPLOYMENT
(ESTIMATES IN THOUSANDS)

Industry	1976	1980	1985
Total all industries	78.9	94.8	120.6
Mining	0.3	0.3	0.4
Construction	4.0	6.2	7.6
Manufacturing	5.1	6.9	9.1
Transportation, communication, public utilities	6.0	6.8	7.8
Trade	18.0	23.3	32.9
Finance, insurance, real estate	4.2	4.9	5.8
Services	27.9	32.5	41.3
Government	13.4	13.9	15.7

Source: State of Nevada, Employment Security Department, Nevada Annual Planning Report, May 1976.

Establishment-based industrial employment for the Reno area is projected to increase by 113 percent between 1970 and 1985. This is an average annual increase of 5.17 percent. Between 1976 and 1985 the projection is a 53 percent increase, or an average annual increase of 4.83 percent. Employment is, therefore, projected to increase at a decreasing rate through the 1985 period.

Unemployment, which averaged 7.8 percent of the labor force in 1975, should decline considerably. Unemployment within the more populated areas (Reno-Sparks, Carson City, and Lake Tahoe) is reflective of national trends in economic growth. Rural areas can expect to have lower unemployment levels than the urban areas as jobs are generally sought within the urban sector.

Population Characteristics

The population of Humboldt and Lander Counties from 1976 through 1985 is expected to increase 14.3 and 18.5 percent, respectively, or at an annual rate of 1.5 and 1.9 percent, respectively. (See Table 2-31.)

TABLE 2-31
POPULATION ESTIMATES, HUMBOLDT AND LANDER COUNTIES AND ASSOCIATED COMMUNITIES, 1975, 1980, 1985, 1990, 2000

Population component	1975	1980	1985	1990	2000
Humboldt County:[a/]	7,161	8,001	8.706	9,243	10,696
Winnemucca	3,994	4,481	4,875	5,176	5,990
Percent of Humboldt County[b/]	56	56	56	56	56
Lander County:[a/]	3,281	3,382	3,487	3,594	3,820
Battle Mountain	2,236	2,700	2,790	2,875	3,056
Percent of Lander County[b/]	68	80	80	80	80

Sources: a/ University of Nevada, Reno, Bureau of Business and Economic Research. Revised March 1977 Population Projections. b/ Nevada State Land Use Planning Agency. "The Costs of Providing County Services to Outlying Developments in Rural Nevada," May 1977.

Employment Characteristics

Employment, through 1985, should take on characteristics similar to the present make-up, with comparatively low levels of unemployment in Humboldt and Lander Counties (within the three to five percent range). Service and trade industries should continue to provide the dominant sources of employment in Humboldt County. Lander County should continue to be mining-oriented in employment potential.

Income and Expenditures

The wholesale and retail trade sector should continue to be the largest single inducer of personal income in Humboldt County. Lander County can expect mining to represent the largest share of personal

income through 1985. Per capita personal income, projected at 105 percent of national projections, should be representative of the State average, which should continue to be one of the highest in the nation (1972 Obers Projections, Vol. 7: Economic Acitivity in the U. S., 1974).

Government Finance and Taxation

The ability to finance the provision of public services depends (for the most part) on the rate and valuation of property. Since there is an upper limit to the rate that can be charged to property, assessed valuation must necessarily increase in order to expand the revenues generated through taxation. New construction and increased property values depend upon economic growth; both Winnemucca and Battle Mountain should provide some economic stimulus through 1985.

Housing Characteristics

Winnemucca appears to offer the best potential (although slight) for a single-unit housing development in the near future. Approximately 80 residential lots with sewer and water facilities are readily available for construction. There are also 500 to 600 unimproved home sites on the outskirts of town which would require well and septic tank installation prior to development. A new subdivision is also planned to include about 180 middle income plots, with first-phase construction to begin in the near future.

Because of excessive demand in the area, most of the home sites would be absorbed by the local populace even if all the potential sites were developed. The opportunity to acquire a site for a single family dwelling in Battle Mountain would be very slight, since there are only about 25 improved lots presently available for purchase.

A new complex is planned in that community which will offer 28 lots for sale and 29 for rent. However, the most immediate potential is in a park presently under construction which would provide 29 lots for sale.

Education

Within the community of Winnemucca, educational capabilities should continue to be adequate. The additional students derived from population growth should not put great strain on the community's educational system through 1985.

There is some concern about future educational services within the Battle Mountain community. Battle Mountain High School should reach (and exceed) student capacity by 1980 through community population growth. The other schools in Battle Mountain (Mary S. Black and Eliza Pierce) have some room for student expansion, although they should be approaching capacity by 1985.

Health Services

Health facilities appear adequate to handle the expected population growth in Humboldt and Lander Counties through 1985. The hospitals in Winnemucca and Battle Mountain have excess occupancy to accommodate the expected increase. There may be a need for additional medical personnel in the Battle Mountain area by 1985; however, positions should not be filled until the need arises.

Law Enforcement

There should be no appreciable change in the law enforcement capabilities for Humboldt and Lander Counties. Crime occurrence should increase as population increases, although at a much lower rate than in areas of high population such as Reno-Sparks and Las Vegas.

Fire Control

There should be little, if any, change in the fire-fighting capabilities of the communities of Winnemucca and Battle Mountain. Any additional equipment requirements would reflect population growth and structural expansion.

Attitudes and Expectations

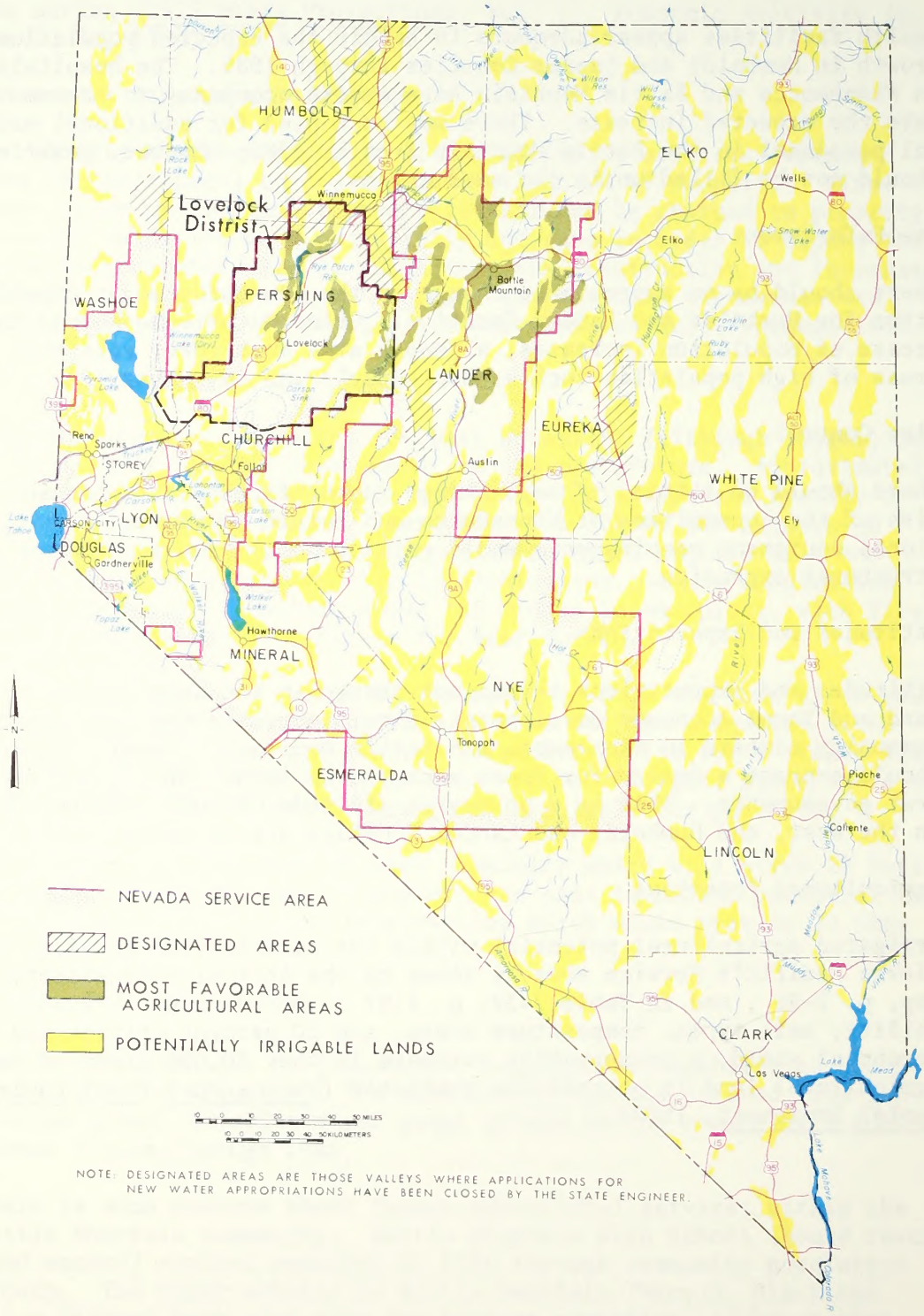
Attitudes and expectations should not change in the near future. Land and local economic developments should permeate the opinions of community members in Winnemucca and Battle Mountain. Local opinion should express a desire for fewer controls by local, State, and Federal governments. This is a pervasive attitude of rural communities in the West, and Humboldt and Lander Counties are no exception.

Agricultural Potential

Irrigated agricultural potential within the northeastern portions of Sierra Pacific's Service Area is shown on the Agricultural Potential Map, p. 2-96 , and in Table 2-32, p. 2-97 . Based on water availability, soil types, temperature zones, and 50 percent utilization of perennial yield, a conservative estimate is that 30,000 acres of new agricultural land is potentially available (Oreana-Hunt Final Environmental Statement, 1977).

LOVELOCK DISTRICT

IRRIGATED AGRICULTURAL POTENTIAL



NOTE: DESIGNATED AREAS ARE THOSE VALLEYS WHERE APPLICATIONS FOR NEW WATER APPROPRIATIONS HAVE BEEN CLOSED BY THE STATE ENGINEER.

TABLE 2-32
LOVELOCK DISTRICT IRRIGATED AGRICULTURAL POTENTIAL[a/]

Hydrographic Area[b/]	County	Irrigable Acres[c/]	Perennial yield in AF/Y (Water)[d/]	Land for irrigation based on perennial yield (Acres)[e/]	Land irrigated in 1969 (Acres)[f/]	Additional land for irrigation (Acres)[g/]	Electrical power required (Kilowatts)[h/]	Estimated private land in area (Percent)[i/]
61	Eureka	44,000	30,000	15,000	5,745	9,255	9,070	86
54	Eureka/Lander	55,000	16,000	8,000	1,800	6,200	6,076	18
55	Lander	24,000	4,000	2,000	1,200	800	784	08
64	Humboldt/Lander	45,000	36,000	18,000	11,680	6,320	6,193	26
59	Lander	55,000	10,000	5,000	800	4,200	4,116	37
131	Pershing/Lander	40,000	8,000	4,000	640	3,360	3,293	03
65	Pershing/Humboldt	15,500	36,000	18,000	420	17,580	17,228	70
130	Pershing	9,000	3,000	1,500	100	1,400	1,372	06
132	Pershing	2,900	500	250	30	220	216	02
128	Pershing	38,000	15,000	7,500	0	7,500	7,350	01
129	Pershing	56,000	10,000	5,000	1,200	3,800	3,724	23
72	Pershing	65,000	3,000	1,500	400	1,100	1,078	32
73	Pershing	12,000	43,000	21,500	31,000	--	--	--
TOTAL		461,400	214,500	107,250	55,015	61,735	60,500	--

a/ Lovelock District is the northeast portion of Sierra Pacific's service area, comprising parts of Humboldt, Pershing, Lander and Eureka counties.

b/ Nevada has been divided into 14 hydrographic regions and basins by the Nevada Division of Water Resources and the U.S. Geological Survey to compile water resource and use information. These regions are also subdivided into 232 hydrographic areas (valleys) for more detailed study. The hydrographic areas delineated above are pertinent to our study area.

c/ Irrigable acres as defined in this study area are those soils that have slight to severe limitations that reduce the choice of crops, and are located in 100-200 day freeze-free zones.

d/ Perennial yield is the amount of groundwater which can be removed from a hydrographic area each year without depleting the groundwater reservoir. Above figures represent "Undesignated" valleys.

e/ Land available for irrigation is based on a estimated per acre crop water consumption by county and crop. For example; in our study area an estimated 2 acre feet is the crop consumptive water requirement. Therefore, column 4 ÷ 2 = land available for irrigation.

f/ See Appendix B "Irrigable land by hydrographic area for Nevada", forecast for the future - agriculture, Report No. 8, Division of Water Resources, Carson City, Nevada.

g/ Column 5 - Column 6 = that land that is additionally available for irrigation based on crop water requirements and undesignated valley perennial yield.

h/ Electrical power demands determined from existing power requirements found on a extensive farming operation in the Winnemucca area. This operation requires 17,000 horsepower, which converts to .98 kilowatts per acre. Thus column 7x.98 = column 8.

i/ This column indicates the ratio of private land to public land in column 3.

3

ENVIRONMENTAL IMPACTS OF THE PROPOSED ACTION

ENVIRONMENTAL IMPACTS OF THE PROPOSED ACTION

3

ENVIRONMENTAL IMPACTS OF THE PROPOSED ACTION

INTRODUCTION

Adverse and beneficial impacts described within this chapter are those impacts which may occur to the existing environment if the Applicant's proposed action is undertaken.

Potential impacts to the various resources (identified in Chapter 2) are discussed and described in relation to the major components of the proposed project, i.e., the power plant complex, transmission lines, and communications (microwave) system, as identified in Chapter 1. Paragraphs under the subheads are organized to discuss construction impacts first, followed by operational impacts. If no impact occurs due to either of the above, no discussion is included.

For purposes of this analysis, the transmission line corridors are considered general routes within which a transmission line right-of-way may be granted. Text discussion and graphics within this chapter which refer to the various corridors by letter designation are keyed to the ES Area Map, p. 1-11 .

Potential impacts to the existing environment would include:

(a) Impacts which would occur within the Environmental Statement (ES) area.

(b) Impacts on the social-economic structure within the ES area and within the area generally defined as the Sierra Pacific Power Company's Service Area.

(c) Secondary impacts to the primary load center within the Service Area (Reno-Carson City-Lake Tahoe area).

A summary of impacts by corridor and plant site is shown on Table 3-24, p. 3-72 .

TOPOGRAPHY

Power Plant Complex

The construction of the North Valmy generating station and related facilities would not significantly impact the topography of the site.

Transmission and Communications Systems

Electrical transmission line construction within any of the corridors under study would not significantly impact the topographic profile. Construction of tower pads, storage or staging areas, and access roads would require minor alteration of the terrain features along portions of the right-of-way. Road work and pads would require some construction cuts and fills in rough terrain to provide level areas for movement of supplies and heavy construction equipment. Some new access roads about 20 feet wide would have to be constructed to areas near the right-of-way having limited access.

The construction, operation, or maintenance of the microwave stations would have no impact upon the topographic profile other than the minor leveling of the selected sites and possible access road cuts and fills.

GEOLOGY

Power Plant Complex

Construction of the North Valmy generating station and related facilities would have no impact upon the geologic structure of the site, although geology would be an important consideration in the design of the plant foundation.

Transmission and Communications Systems

The construction, operation, and maintenance of a transmission line within any of the corridors under study would have no impact on the geologic structure of the area.

The construction, operation, and maintenance of the microwave communications stations would have no impact on the geologic structure of the area.

SEISMIC ACTIVITY

Power Plant Complex

The response of the geologic structure within the ES area to seismic events is important because of the potential impact on the power plant complex should an earthquake occur in the vicinity.

The basalt bedrock at the proposed project site is apparently not cut by active faults and should be structurally stable under seismic shock. Only minimal amplification of seismic waves would occur in the 50 to 55 feet of soil above bedrock. Therefore, earthquake-induced ground movement at the power plant complex ground surface would be only slightly greater than at bedrock. The subsurface sediments at the complex are not subject to liquefaction because they are not loose and saturated. The saturated sediments below the water table are dense and have carbonate cementation or other cohesive binders. The loose sands of the floodplain near the access road-railroad bridge are potentially liquefiable, but design and construction techniques have taken this into account. (The bridge has already been constructed.)

Although the project site is located in Seismic Zone 3 (see the Seismic Risk Map, p. 2-6) no major damage to the power plant complex is expected, as the Treaty Hill Fault is considered inactive.

Based on the geologic and soil structure of the project site, probable earthquake damage to the proposed North Valmy generating station and related facilities would be minor. The level of damage would be dependent on the magnitude of the earthquake and the proximity of its epicenter to the power plant complex. (See Table 2-1, p. 2-5 .)

Transmission and Communications Systems

All of the corridors under study are equally vulnerable to possible earthquake damage since they pass through Seismic Zone 3, indicating that major damage to the proposed transmission lines could occur. (See the Seismic Risk Map, p. 2-6 .) Tower damage and line breakage could result from major earthquakes with epicenters near the transmission lines. Additional earthquake-induced impacts would be:

(1) Temporary power outages in homes, businesses, and industry, and

(2) Other transmission lines in the Service Area would have to carry an increased load while the damaged line was being repaired.

The proposed microwave sites would be vulnerable to the same potential earthquake damage as the generating plant and transmission lines.

SOILS

Power Plant Complex

Construction activities at the plant site would permanently disrupt the surface and subsurface soil structure. (See Table 1-1, p. 1-10 , for the estimated surface disturbance and volumes of earth which would be moved.) The surface soils in the immediate vicinity of the plant would continue to be disrupted by the daily operation and maintenance activities at the plant.

Operation of the power plant would result in the deposition on the soil of trace elements from the stack effluents and of salts from cooling tower drift. Table 3-1, p. 3-7 , shows a comparison of the existing concentrations of selected trace elements with the predicted accumulations of these substances in the soil over the life of the plant. (Also see the Air Quality and Vegetation sections of this chapter.)

Operation of the cooling towers would result in the deposition of salts for a distance of approximately three miles from the towers. The maximum deposition rates of 2.5 pounds per acre per month at 1,000 feet and 0.02 pounds per acre per month at three miles were calculated by Westinghouse. Westinghouse estimated deposition of salts from cooling tower drift would amount to 1.4×10^7 pounds over the life of the plant (37 years). Since a large part of this would occur within the boundaries of the plant facilities where vegetation would have been removed and the soil surface disturbed, a figure of 0.3 pounds per acre per month was used to represent salt deposition rates outside the plant-complex boundary. Using this figure, then, the estimated accumulation of salts in the soil over the life of the project would be 162 parts per million (ppm). Calculations for arid areas (Roffman and Roffman, 1973), suggest this relatively small contribution of salts would have an insignificant impact on local soils, which are fairly saline (in excess of 10,000 ppm in some areas).

Transmission and Communications Systems

Disturbance of the soil profile by the proposed project would create considerable impact to the environment, either directly or indirectly. The proposed construction operations would include increased use of existing unmaintained roads, construction of new access roads along the right-of-way, building of storage yards and miscellaneous other areas, and construction of tower base areas. Table 1-14, p. 1-42 , presents a summary of land require-

TABLE 3-1
COMPARISON OF TRACE ELEMENT PARTICULATE DEPOSITION WITH BASELINE CONCENTRATIONS IN SOILS AT THE NORTH VALMY STATION

Element	Total added concentration to soil in 37 years[a/] (ppm)	Present concentration (ppm)
Ag (Silver)	1.4×10^{-5}	< 1
As (Arsenic)	2.1×10^{-4}	8.1
B (Boron)	3.1×10^{-3}	30
Ba (Barium)	3.5×10^{-3}	3,000
Be (Beryllium)	1.4×10^{-5}	< 1
Cd (Cadmium)	3.6×10^{-5}	3.0
Co (Cobalt)	1.8×10^{-3}	5
Cr (Chromium)	6.9×10^{-3}	10
Cu (Copper)	7.6×10^{-4}	19
F (Fluorine)	4.9×10^{-3}	244
Ga (Gallium)	3.6×10^{-4}	200
Ge (Germanium)	2.2×10^{-5}	< 10
Hg (Mercury)	6.2×10^{-7}	0.02
Li (Lithium)	2.8×10^{-4}	200
Mn (Manganese)	4.7×10^{-3}	300
Mo (Molybdenum)	2.2×10^{-4}	<.10
Nb (Niobium)	3.6×10^{-4}	< 10
Ni (Nickel)	8.5×10^{-4}	20
Pb (Lead)	2.2×10^{-4}	31
Sb (Antimony)	1.4×10^{-5}	1.1
Se (Selenium)	1.9×10^{-5}	< 0.5
Sr (Strontium)	6.0×10^{-3}	300
U (Uranium)	2.2×10^{-5}	--
V (Vanadium)	3.5×10^{-3}	50
Zn (Zinc)	8.5×10^{-4}	30
Zr (Zirconium)	5.6×10^{-3}	200

a/ Assuming no leaching and that all added elements are distributed within the top one inch of soil and that the soil density is 60 lb/feet^3, and based on an average power plant load factor of 72.03 percent.

Source: Applicant's Environmental Report.

ments and surface disturbance which would result from these construction activities.

Following construction, access roads would be retained for maintenance of the line, which would tend to increase public access to remote areas.

Damage to the topsoil by vehicle movement is the primary projected impact, and the damage would vary among the soil types. In the lower elevation areas natural rehabilitation would be slower because of the drier climate. Once the topsoil has been disturbed in these areas where natural plant succession is slow, scars left by construction equipment would remain for decades. These soils have been developing at a very slow rate for several thousand years, and most of the surfaces contain silt and very fine sands (ranging in depth from eight to 24 inches) that are easily eroded by wind and water when they are dislodged.

Soil in the higher rainfall areas would be more subject to water erosion than those in drier areas because of the effects of more precipitation on steeper slopes, but they would rehabilitate faster if erosion control measures were successful. Soil surface depth ranges are about the same as in the drier areas and would be damaged equally by vehicle travel, but would not be displaced as severely by wind action. Occasional use of the access roads during line maintenance would contribute slightly to wind erosion.

The determinations of high, medium, and low erosion hazard in Figure 3-1, p. 3-9 , are based on slope factors (see the ES Area Map, p. 1-11), and on the soils within the corridors (see the Soils Map, p. 2-9).

Erosion hazard is defined in terms of two factors: wind loss and sediment yield. Erosion hazard from wind loss would be insignificant in areas of project construction because of the narrow width of unprotected surface in transmission line corridors and at the plant site after the facilities are in place (A Universal Equation for Measuring Wind Erosion, 1961). Therefore, the erosion hazard was determined using the sediment yield per square mile per year (BLM Manual 7317 and Pacific Southwest Interagency Committee methods on sediment yields). A low erosion hazard is equal to loss of less than 800 tons per square mile per year. A medium erosion hazard equals a loss of between 800 to 1,600 tons per square mile per year. A high hazard equals a loss greater than 1,600 tons per square mile per year.

Construction of the seven microwave sites would have minimum impact on the soil. Each proposed site would be at a location already having facilities and/or access. These sites would only require a small amount of leveling prior to construction. (See the ES Area Map, p. 1-11 , and the Chapter 1 discussion, p. 1-45 .)

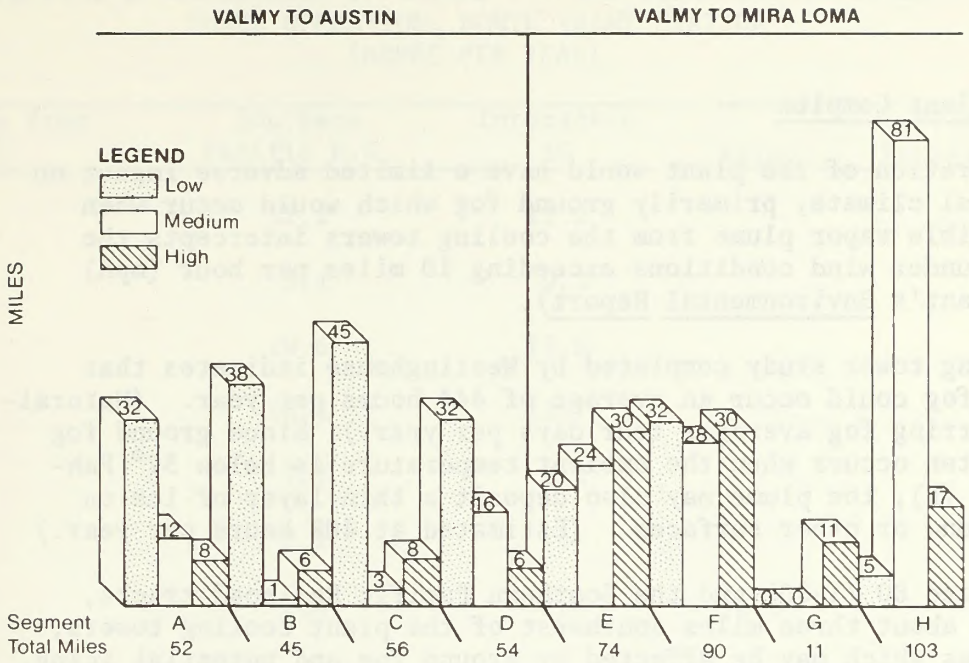


FIGURE 3-1 – EROSION HAZARD

CLIMATE

Power Plant Complex

The operation of the plant would have a limited adverse impact on the local climate, primarily ground fog which would occur when the visible vapor plume from the cooling towers intercepts the ground under wind conditions exceeding 10 miles per hour (mph) (Applicant's Environmental Report).

A cooling tower study completed by Westinghouse indicates that ground fog could occur an average of 444 hours per year. (Naturally occurring fog averages four days per year.) Since ground fog most often occurs when the ambient temperature is below 32° Fahrenheit (F), the plume may also deposit a thin layer of ice on the ground or other surfaces. (Estimated at 408 hours per year.)

Interstate 80 (I-80) and the Southern Pacific Railroad tracks, located about three miles southwest of the plant cooling towers, are areas which may be affected by ground fog and potential icing. (Both I-80 and the railroad tracks are partly shielded from the cooling towers by Treaty Hill.) The Western Pacific Railroad tracks are located about one mile northeast of the cooling towers (with no intervening topographic features). Table 3-2, p. 3-11 , indicates the number of hours per year that I-80 and the two railroads may experience ground fog or icing.

Under "worst-case" conditions, it is estimated that a maximum distance of 400 meters of Interstate 80, 400 meters of the Southern Pacific tracks, and 150 meters of the Western Pacific tracks would be affected by icing and fogging.

TABLE 3-2
POTENTIAL OF OCCURRENCE OF GROUND FOG AND ICING DUE TO COOLING TOWER OPERATION, NORTH VALMY STATION
(HOURS PER YEAR)

Direction from plant	Southern Pacific R.R.	Interstate 80	Valmy	Western Pacific R.R.
S	12.2	12.2		
SSW	9.1	9.1		
SW	19.6	17.5		
WSW	16.1	12.7		
W	7.7	3.2		
WNW	2.2	---		
SSE	2.4	2.4	2.4	
NNW				25
N				60.7
NNE				28.5
NE				22.8
ENE				26.9
E				41.7
ESE				27.3
SE				21.1
Total	69.3	57.1	2.4	254

Source: Applicant's Environmental Report.

It is the intent of this discussion to identify the various pollutants which may be introduced into the atmosphere as a result of the construction and operation of the proposed project. It should be noted that the impacts to other resources caused by these airborne pollutants are discussed elsewhere in this chapter under the individual resource headings. (For example, the effects of sulfur dioxide on vegetation are covered in the Vegetation section.)

Emissions

The combustion of coal to generate electricity creates an impact upon existing air quality through the introduction of particulate matter and combustion gases into the atmosphere. Of the various compounds introduced into the atmosphere from a project such as North Valmy, those with the greatest potential for environmental degradation are sulfur dioxide (SO_2), nitrogen dioxide (NO_2), and particulates. Because of the potential impacts from these emissions, Federal and State standards have been implemented to establish both allowable emission rates and allowable concentration levels of these pollutants within the surrounding, or ambient, air. National and State New Source Performance Standards (NSPS) apply to the proposed North Valmy project and establish the allowable emission rates. The Federal standards appear in 40 Code of Federal Regulations (CFR) 60, while the State of Nevada standards are published in the State of Nevada Air Quality Regulations (NAQR), as Amended.

Table 3-3, p. 3-12 , summarizes emission standards which would apply to the North Valmy project and compares the projected emission rates with these standards for both "most probable" and "worst-case" coal.

TABLE 3-3
CALCULATED RATES PER UNIT

Emission	State (standards) allowable rate (g/s)[a/]	Most probable coal			"Worst case" coal		
		Emission rate (g/s)	Emission rate (lb/hr)	Percent of standard	Emission rate (g/s)	Emission rate (lb/hr)	Percent of standard
Sulfur dioxide (SO_2)	384.0	246.0	1,956.0	64	378	2,999.0	98
Nitrogen dioxide (NO_2)	220.4	220.0	1,744.0	100	220	1,744.0	100
Particulate matter	31.48	4.72	39.0	15	6.82	42.7	22

Adapted from Applicant's Environmental Report and State of Nevada analysis.

a/ g/s - grams per second.

Ambient Air Conditions

In addition to the standards which limit the amount of emissions permitted from a project, an additional set of State and Federal standards have been established to assure that these emissions, when introduced into the atmosphere, are sufficiently dispersed. These standards which limit the concentration of pollutants over time are referred to as Ambient Air Quality Standards and are summarized in Table 3-4.

TABLE 3-4
APPLICABLE AMBIENT AIR QUALITY STANDARDS

Pollutant	Averaging time	Standard, $\mu g/m^3$ National Primary	National Secondary	State of Nevada	Class II increments
Sulfur dioxide	3 hours	--	1,300	1,300	512
	24 hours	365	--	260	91
	Annual	80	--	60	20
Particulates	24 hours	260	150	150	37
	Annual geometric mean	75	60	60	19
Nitrogen dioxide	Annual	100	100	100	100

Source: Applicant's Environmental Report.

Predicting the location and concentration of pollutants in ambient air is a complex procedure usually done by computer. As different computer models have been developed and tested against actual field conditions they have become more accurate in their predictive capability, but projections still vary among models using the same base data. In assessing the proposed North Valmy project separate sets of calculations have been completed by the Applicant's environmental consultants, the U. S. Environmental Protection Agency (EPA), and by the Nevada Division of Environmental Protection Services.

Based on their acceptance of the Applicant's methodologies and on their own modeling projections, the Nevada Division of Environmental Protection Services has issued an air quality permit for the project. The EPA air quality permit is marked for issue February 28, 1978.

EPA has reviewed the Westinghouse modeling procedures and has stated in a letter of August 11, 1977, that "...we feel that the dispersion modeling procedures and the emission rates used by Westinghouse Environmental Systems Division are acceptable."

Arriving at a predicted level of pollutant concentration at any given point over a specified time period is a function of such variables as the chemical composition of the coal being burned, the stack height and emission rates, the existing climate and atmospheric characteristics, and the nature of the surrounding terrain.

The following Tables 3-5 and 3-6, summarize some of the results of the predictions developed by Westinghouse, EPA, and the State of Nevada. In some cases the Westinghouse projections were accepted without full computer verification simply because the predicted emissions were sufficiently below established standards that verification of predicted concentrations was not deemed necessary. Figure 3-2, p. 3-15 , shows potential plume receptor points in the vicinity of the proposed project.

TABLE 3-5
SHORT- AND LONG-TERM MAXIMUM GROUND LEVEL CONCENTRATIONS FOR PARTICULATES AND NITROGEN DIOXIDE

Pollutant	Limiting air quality standard[a] ($\mu g/m^3$)	Calculated concentration ($\mu g/m^3$) Worst-case coal	Most probable coal	Direction, distance and elevation of receptor
Particulates (Same computation technique as used for SO_2):				
24-hour concentration	37	1.3	1.2	(190°, 15.0 km, 5,400 ft-msl)
Annual average	19	--	0.1	(200°, 12.0 km, 5,160 ft-msl)
Nitrogen dioxide:				
Annual average (same computation technique as used for SO_2)	100	--	7.9	(200°, 12.0 km, 5,160 ft-msl)

Source: Applicant's Environmental Report.

a/ Class II significant deterioration.

TABLE 3-6
SUMMARY OF PREDICTED SULFUR DIOXIDE CONCENTRATIONS

Determining agency	Type of model or condition used	Type of coal	Predicted concentrations $\mu g/m^3$ averaging time 3 hr.	24 hr.	Annual	Ambient air quality standards NAQR Averaging time 3 hr.	24 hr.	Annual	Class II (EPA) 3 hr.	24 hr.	Annual	Direction, distance, and elevation of receptor from plant
Nevada Environmental Protection Services	PTMTP	Most probable	345	92	--							
		Worst case	530	143[a]	--	1,300	260	60	512	91	20	180°, 15.0 km, 411.5 meters above ground level
Westinghouse Environmental Systems Department	Modified CRS 1 Inversion breakup	Most probable	362	61	7.1							
			94	--	--							190°, 15.0 km 289.6 meters above ground level
	Modified CRS 1 Inversion breakup		554	94	--	1,300	260	60	512	91	20	
		Worst case	145	--	--							
U. S. EPA Region IX	Valley	Most probable	--	87	10.1							
						1,300	260	60	512	91	20	180°, 15.0 km 381.0 meters above ground level
		Worst case	--	134[a]								

a/ Continuous in-stack sulfur dioxide monitoring can insure that this coal will not be used for a period of 24 hours.

Source: State of Nevada, Division of Environmental Protection, "Review of Sierra Pacific Power Company's North Valmy Application."

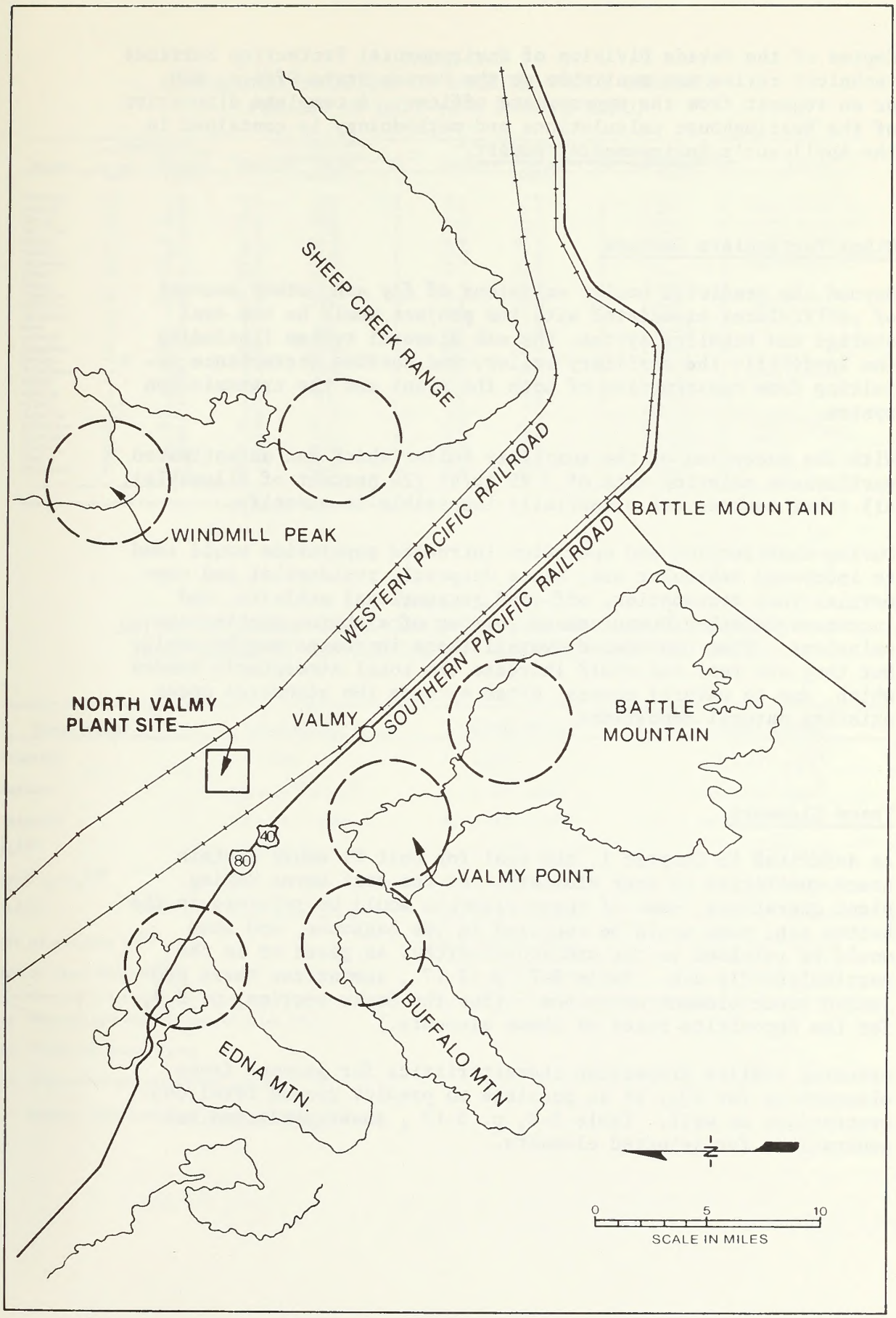


FIGURE 3-2 HIGH TERRAIN AREAS POTENTIALLY AFFECTED BY THE PROPOSED NORTH VALMY

Copies of the Nevada Division of Environmental Protection Services technical review are available at the Nevada State Office, BLM, or on request from the appropriate offices. A complete discussion of the Westinghouse calculations and methodology is contained in the Applicant's Environmental Report.

Other Particulate Sources

Beyond the predicted boiler emissions of fly ash, other sources of particulates associated with the project would be the coal storage and handling system, the ash disposal system (including the landfill), the auxiliary boiler, and surface disturbance resulting from construction of both the plant and the transmission system.

With the exception of the auxiliary boiler which has an estimated particulate emission rate of 4.99 lb/hr (29 percent of allowable), all other sources are essentially impossible to quantify.

During construction and operation increased population would lead to increased vehicular use, waste disposal, residential and commercial fuel consumption, off-road recreational activity, and increases in other human-caused sources of airborne particulate emissions. When considered overall these increases may be small, but they are real and would increase the total atmospheric burden which, due to natural causes, often exceeds the standards under existing natural conditions.

Trace Elements

As described in Chapter 1, the coal for Unit #1 would contain trace quantities of many elements. As the coal burns during plant operations, some of these elements would be retained in the bottom ash, some would be captured in the baghouse, and some would be released to the atmosphere either as gases or in the particulate fly ash. Table 3-7, p. 3-17 , summarizes these projected trace element emissions. (See the Soils section, p. 3-7, for the deposition rates of these elements.)

Assuming similar dispersion characteristics for gaseous trace elements as for SO_2, it is possible to predict ground level concentrations as well. Table 3-8, p. 3-17 , shows predicted concentrations for selected elements.

TABLE 3-7
PREDICTED EMISSIONS OF SELECTED TRACE ELEMENTS PER 250 MW UNIT (100 PERCENT LOAD)

Element	Concentration		Fractionation after coal combustion			Location after fractionation					Remarks
						Baghouse			Stack emissions		
	In coal	After coal combustion	Bottom ash	Fly ash	Gas	Bottom ash	Fly ash	Gas	Particulates	Gas	
	(ppm)	(lb/day)	(lb/day)			(lb/day)			(lb/day)		
Antimony	<0.2	<1.04	<0.2	<0.83	0	<0.2	<0.83	0	$<2.0\times10^{-3}$	0	Note: Calculations assume that the trace elements not emitted as gases are distributed 20 percent to bottom ash and 80 percent to fly ash.
Arsenic	3	15.65	3.15	12.52	0	3.15	12.49	0	3.1×10^{-2}	0	
Barium	50	260.76	52.15	208.62	0	52.15	208.10	0	5.2×10^{-1}	0	
Beryllum	0.2	1.04	0.2	0.83	0	0.2	0.83	0	2.0×10^{-3}	0	
Boron	44	229.47	45.89	183.58	0	45.89	183.12	0	4.5×10^{-1}	0	
Cadmium	<0.5	<2.61	<0.52	<2.09	0	<0.52	<2.09	0	$<5.2\times10^{-3}$	0	
Chromium	100	521.53	104.31	417.22	0	104.31	416.18	0	1.4	0	
Cobalt	26	135.60	27.11	108.48	0	27.11	108.24	0	2.71×10^{-1}	0	
Copper	11	57.34	11.47	45.89	0	11.47	45.78	0	1.15×10^{-1}	0	
Fluorine	120	625.83	12.60	290.39	262.85	12.60	289.66	262.85	7.26×10^{-1}	262.85	58 percent particulates; 42 percent vapor.
Gallium	5	26.1	5.2	20.9	0	5.2	20.85	0	5.2×10^{-2}	0	
Germanium	0.3	1.56	0.31	1.25	0	0.31	1.25	0	3.13×10^{-3}	0	
Lead	3	15.6	3.1	12.5	0	3.1	12.25	0	3.13×10^{-2}	0	
Lithium	4	20.9	4.2	16.7	0	4.2	16.66	0	4.17×10^{-2}	0	
Manganese	67	345.42	69.88	279.54	0	69.83	278.84	0	6.99×10^{-1}	0	
Mercury	0.09	0.47	9.39×10^{-3}	3.76×10^{-2}	0.42	9.39×10^{-3}	3.75×10^{-2}	0.42	9.39×10^{-5}	0.42	10 percent particulates; 90 percent vapor.
Molybdenum	3	15.65	3.15	12.52	0	3.15	12.49	0	3.13×10^{-2}	0	
Nickel	12	62.58	12.5	50.07	0	12.5	49.94	0	1.25×10^{-2}	0	
Niobium	5	26.1	5.2	20.9	0	5.2	20.85	0	5.2×10^{-2}	0	
Silver	0.2	1.04	0.2	0.83	0	0.2	0.83	0	2.0×10^{-3}	0	
Selenium	0.9	4.69	0.28	1.12	3.29	0.28	1.12	3.29	2.82×10^{-3}	3.29	30 percent particulates; 70 percent vapor.
Strontium	85	443.30	88.66	354.63	0	88.66	353.75	0	8.87×10^{-1}	0	
Uranium	3	15.65	3.15	12.52	0	3.15	12.49	0	3.13×10^{-2}	0	
Vandium	50	260.76	52.15	208.62	0	52.15	208.10	0	5.2×10^{-1}	0	
Zinc	12	62.58	12.52	50.07	0	12.52	49.95	0	1.25×10^{-1}	0	
Zirconium	80	417.22	83.44	333.78	0	83.44	332.95	0	8.34×10^{-1}	0	

Source: Westinghouse Environmental System Division (personal communication).

TABLE 3-8
ESTIMATED GROUND LEVEL CONCENTRATIONS OF SELECTED GASEOUS TRACE ELEMENTS AND RADIOACTIVE ELEMENTS (FOR TWO UNITS)

Trace element	Emission rate	Concentration	
		Maximum 24-hour	Annual average
Fluorine	1.1 g/sec	1.4 $\mu g/m^3$	1.6×10^{-2} $\mu g/m^3$
Mercury	1.9×10^{-3} g/sec[b/]	1.1×10^{-4} $\mu g/m^3$	2.7×10^{-5} $\mu g/m^3$
Selenium	1.4×10^{-2} g/sec	8.4×10^{-4} $\mu g/m^3$	2.0×10^{-4} $\mu g/m^3$
μRa^{226}	4.4×10^{-10} g/sec	2.0×10^{-18} $\mu Ci/ml$[c/]	5.0×10^{-19} $\mu Ci/ml$
MPC[a/] of Ra^{226}		2.4×10^{-13} $\mu Ci/ml$	1.0×10^{-12} $\mu Ci/ml$
Th^{230}	4.3×10^{-13} g/sec	3.8×10^{-20} $\mu Ci/ml$	1.0×10^{-19} $\mu Ci/ml$
MPC of soluable Th^{230}		9.6×10^{-15} $\mu Ci/ml$	4.0×10^{-14} $\mu Ci/ml$
MPC of insoluable Th^{230}		3.6 c 10^{-14} $\mu Ci/ml$	1.5×10^{-13} $\mu Ci/ml$

a/ Maximum permissible concentration (MPC).

b/ Grams per second (g/s).

c/ Microuries per milliliter ($\mu Ci/ml$).

Source: Applicant's Environmental Report.

While no State of Federal standards have been established to limit emissions of trace elements from fossil fueled power plants it is recognized that minute quantities of these elements would be deposited in the surrounding environment during the life of the project. The impact of these additions cannot be accurately estimated, but can only be observed over time through ongoing research and monitoring programs. At this time no programs have been developed for monitoring the North Valmy project for trace element impacts.

Cooling Tower Drift and Ozone

An additional source of emissions at the project site would be the cooling towers. These units are designed to operate with a maximum drift rate of approximately 6.5 gallons of water per minute. Cooling tower drift would be composed of water drops carried out of the towers by the induced updraft. After exiting the towers these drops would eventually fall to the ground, depositing the dissolved solids (salts) concentrated in the water.

Based on the design drift rate and the makeup of the cooling water, the Applicant has projected the maximum deposition rate of dissolved solids from the cooling towers to be 2.5 pounds per acre per month at a distance of 1,000 feet downwind, and .02 pounds per acre per month at a distance of three miles downwind.

Over the life of the project (37 years) it is estimated that 1.4×10^7 pounds of dissolved solids would be deposited on the soil as a result of cooling tower operations. Using available wind data, it is projected that most of the drift would be deposited within a radius of three miles of the towers--an area of some 19,408 acres. (See the Soils and Vegetation sections of this Chapter.)

Recent studies of large coal-fired power plants in the East indicate that smoke stack plumes may consume ozone for distances up to 25 miles downwind of the source (Davis et al., 1974). Beyond 25 miles, however, the plumes can become net producers of ozone. This phenomenon is not well understood, and no conclusions can be made as to the proposed North Valmy plant's effect on ozone concentrations.

Corona effects may be produced by the proposed transmission system when the surrounding air is ionized, forming ozone and nitrogen oxides. Recently conducted studies have shown no measurable quanities of these substances at ground level near transmission lines up to 765 kilovolts (kv). (United States Department of the Interior, BLM. Resource and Lands Investigations (RALI) Program Considerations in Evaluating Utility Line Programs, 1975.)

Visibility

In addition to the introduction of pollutants into the atmosphere, a secondary impact upon the existing atmosphere is caused by a decrease in visibility (increased opacity) caused by the plume emitted from the stack. Nevada state regulations require opacity not to exceed 20 percent. Calculations in the Applicant's Environmental Report indicated that the opacity derived from the plume would equal approximately 10 percent. Opacity would also be derived from atmospheric dust caused by high surface winds. These conditions occur most frequently in the spring or in association with summer thunderstorms and could cause the total opacity (near the plant site) to exceed the Nevada state standard of 20 percent. During 1976, 8 of the 58 samples taken at the Battle Mountain sampling station violated State particulate standards.

Atmospheric emissions from the proposed plant that could degrade visibility are: fly ash, secondary particles (such as sulfates and nitrates formed by chemical transformations), condensed water, nitrogen dioxide, and condensed water from the cooling towers.

As evaluated by the Applicant's environmental consultants a relationship between the visual range and the concentration of suspended particulates can be expressed as:

$$Lv = \frac{24}{0.2 + 0.02(M)}$$

where Lv = visual range, miles
and M = mass concentrations of suspended particulates, $\mu g/m^3$.

This relationship was used to calculate the effect of the plant's particulate emissions on the local visibility. The average measured concentration of suspended particulates in the Valmy area is 26.2 $\mu g/m^3$ (see Table 2-7, p. 2-22). Substituting this concentration in the above equation gives a visual range between 33 and 63 miles. The results of the visibility study conducted in the Valmy area would indicate that the prevailing visibility is at least 60 miles; therefore, the calculated visual range of 63 miles appears to be more realistic for this area.

The maximum calculated 24-hour concentration of suspended particulates due to plant emissions was 1.3 $\mu g/m^3$ (Table 3-5, p-3-14) and is calculated to occur at high terrain approximately 7.4 miles SSW of the plant. Adding this to the measured value of 26.2 $\mu g/m^3$ gives a visual range of 61 miles. Based on this, the visual range from this high terrain point would be reduced a maximum of two miles a few times a year. To an observer in the Humboldt Valley where the particulate concentrations will be much lower than at the high terrain, it is doubtful if there will be any significant reduction in visibility.

Given the existing background concentrations of suspended particulates associated with the wind-carried dust from the desert areas, it is difficult to predict the actual contributions of power plant operations to decreased visibility. It must be acknowledged, however, that over time the addition of particulates and gaseous emissions may have a cumulative negative impact on visibility in the genral areas of the proposed project. For more detailed analysis of general visibility concerns, the reader is referred to The Visibility Issue in the Rocky Mountain West, published by the Los Alamos Scientific Laboratory.

The impacts on water resources caused by the installation and operation of a power plant fall into two categories: water consumption and water quality modification. Consumption is dependent upon the availability of a surface or groundwater supply sufficient to meet the long-term cooling needs of the power plant and on the actual generating capacity of the installed equipment. Water quality modification is dependent upon the method of ultimate disposal of used water from the cooling and operational systems. Secondary impacts on water resources, such as increased irrigation, could be anticipated.

Groundwater

Consumption of water at the North Valmy power plant would be at a rate of approximately 3,830 acre-feet per year (2,376 gallons per minute) per 250 megawatt (Mw) unit. As a comparison, Winnemucca's municipal water consumption during 1976 was 268 acre-feet. Household and lawn watering use for 4,000 residents of Winnemucca, using an average of 65 gallons per capita per day (USGS, Primer on Water Quality, 1965), would be an additional 291 acre-feet annually for a total of 559 acre-feet. The power plant water consumption per unit would be roughly equivalent to the consumption for 1,108 acres of alfalfa per year (the water demand for alfalfa being 3.5 acre-feet per year per acre of crop).

The plant water supplies would orginate from wells for which permits have been granted by the State Engineer. The Applicant has purchased water rights to an existing well producing 400 acre-feet per year. The 8,800 acre-feet now available to the company would exceed the annual water requirement of 7,660 acre-feet (for two units) by 1,140 acre-feet.

None of the Applicant's production wells would be located closer than five miles to the wells that supply water to the City of Battle Mountain. Based on geologic and hydrologic data from test holes and production wells, no impact on the water level or pumping capacities of wells in or near the city is expected to occur from operation of the North Valmy well fields (Applicant's Environmental Report).

Pumping from the well field would not reduce the production rates, but is expected to lower the water levels at one private well which supplies Valmy community residents and at the highway rest area well across from Valmy. The Valmy well is 240 feet deep, and the depth to static water level (groundwater level under conditions of no pumping) is 65 feet. The rest area well is 258

feet deep, and the depth to static water level is 75 feet. Although these two wells should be capable of maintaining their present production rates for many years, it may be necessary to lower the pipes as a result of the plant well field operation.

The proposed well field for the second 250 Mw unit is located just north of 16 existing irrigation wells. Pumping in this proposed well field would probably lower the water levels in some of these irrigation wells to a degree that cannot yet be ascertained. The exact amount would depend on the final location of the plant production wells (within the proposed well field) with respect to the location of the existing irrigation wells. The production wells would be located no closer than two miles from any existing irrigation well, thereby reducing the degree of impact.

Plant production well pumping is not expected to affect the Humboldt River flow because of their distance from the river, the geology of the area, and well design. The completed and proposed production wells would be located at least one mile from the river, with most wells two or more miles distant. Well casing would extend to a depth of 100 feet in each well, so no water would be drawn from the upper 100 feet of material. Near the river floodplain, shallow clays and silts would prevent free interchange of water between the deeper aquifers and the shallower floodplain deposits underlying the river. (See the Water Resources section of Chapter 2, p. 2-23 .)

Extensive groundwater withdrawal can cause land subsidence, but subsidence is not expected to occur in the well field area. Water use allocations and annual recharge for the area are discussed in Chapter 2.

A one-acre leach pond would receive treated effluents from the on-site package treatment plant (25,000 gpd capacity, with treatment consisting of chlorination and extended biological oxidation). The unlined leach pond would be in use a maximum of three years, until the evaporation ponds are operational. The effluent from the package plant would then be routed to the evaporation ponds for disposal.

No impacts to groundwater are expected from use of the leach pond due to high evaporation rates, existing soil characteristics above the aquifer (see Table C-4, p. 10-21), and percolation rates ranging from 7.2×10^{-5} to 1.0×10^{-3} ft/min.

Surface Water

No actual consumption of surface water would take place during the operation of the plant. The proposed water feed system would have no effluent discharge to either surface waters (the Humboldt River) or to the groundwater body (zero seepage from the waste and evaporation ponds).

Water Quality

Power Plant Complex

Some modification of the Humboldt River's suspended solids content could be expected, though such impact would be negligible. The maximum total particulates that would be deposited from stack emissions within one mile of the plant would be 1.08×10^{-4} pounds per acre per month. Over the 37-year life of the plant, the total quantity of particulates that would be deposited in the river is expected to be 0.72 pounds (Applicant's Environmental Report). Assuming none are removed from suspension and none are soluble, the addition of this quantity of suspended solids, amounting to a concentration of 0.02 parts per million, is an insignificant addition to the highly turbid waters of the Humboldt River.

The potential impact on the Humboldt River from runoff of particulate matter originating at the plant is also insignificant. Taking a conservative approach, it was assumed that all solid matter is deposited within the 1,320 square miles of the Pumpernickel Valley, the Kelly Creek, and the Clovers area. Assuming the Humboldt River Basin has erosion rates similar to the Upper Colorado River Basin (where studies have been done), the solids entering the Humboldt River annually from the Pumpernickel Valley, the Clovers, and the Kelly Creek area would total 0.3 metric tons. If all deposited matter from the plant were carried with the runoff, these particulates would comprise only 0.0009 percent of the suspended solids now entering the river annually.

Radioactive substances such as radium (Ra^{226}) and thorium (Th^{230}) would be deposited by the plume at the rates shown below. These concentrations range from one to several orders of magnitude below allowable levels.

Element	Maximum hourly concentrations	
	Calculated	Allowable
Radium (Ra^{226})	7.3×10^{-10} pCi/1	5 pCi/1
Thorium (Th^{230})	7.5×10^{-7} µg/1	2.16×10^{-6} µg/1

a/ U. S. EPA, Interim Primary Drinking Water Regulations, 1975.

b/ Federal Regulations, 10 CFR 20, 1975.

Deposition of trace elements as a result of coal combustion is calculated to be approximately 1.4×10^{-6} pounds per acre per month, or 2.6×10^{-7} ppm. This value is too low for detection except by the most sophisticated research instruments and is far below existing concentrations in the Humboldt River. More detailed information on emission rates of trace elements is shown on Table 3-7 and 3-8, p. 3-17.

Transmission and Communications Systems

Some stream pollution would result from transmission line construction activities wherever the lines cross live streams. During the summer, fall, and winter months the live streams of the area normally have suspended sediment concentrations of less than 1,000 ppm. Construction vehicle activity at stream crossings could cause this figure to approach 5,000 ppm. During the spring months, flows are higher, and the suspended sediment concentrations are greater than 1,000 ppm; construction activities at live stream crossings could increase sediment concentrations to 10,000 ppm. The immediate impacts would be limited to a one-day duration at each crossing, but impacts due to erosion could continue until revegetation occurs. (See Aquatic Habitat portion of the Wildlife section, p. 3-34 .)

The impacts caused by the proposed transmission line crossing live streams would be minimal, as only two live streams (the Humboldt and Truckee Rivers) would be crossed. Additionally, the methods proposed by the Applicant for spanning the rivers would not involve the use of any construction equipment in the river channels.

The Truckee River would be crossed twice, once near Tracy and once within the Pyramid Lake Indian Reservation. Depending on the corridor approved, the Humboldt River would be crossed by the transmission lines as follows (segments are identified on the ES Area Map, p. 1-11):

Segment E - two crossings; near Oreana and near the proposed project site.

Segment H - four crossings; one near Oreana, two near Winnemucca, and one near the proposed project site.

All of the live stream crossings would be adjacent to crossings of the existing Tracy-Oreana 345 kv transmission line or to those of the proposed Oreana-Hunt 345 kv transmission line.

Equipment service sites (the exact number has not yet been determined) located adjacent to live streams could result in gas, oil, and human wastes being deposited through surface flow or seepage. Because the area occupied for equipment service sites would be small, and only temporarily used, the impact of these contaminants on water quality would be minor. Erosion at these sites could continue after the sites had been abandoned.

All the corridors cross intermittent streams, the number of which varies considerably among the corridors. The impacts caused by construction activities at these crossings would be minor. Disturbed soil and debris may be carried by runoff water to nearby drainages. The impacts of construction at intermittent stream crossings would be considered minor because of the existing high level of natural debris build-up and siltation, and the infrequency of surface runoff during most of the year.

Construction and operational activities adjacent to waterways may locally impact water quality. The degree of such impact is expected to be minor, and would depend on the nature of the activities and their duration. Unconsolidated fill materials could block drainages, and the removal of ground cover next to drainage channels would increase the dissolved solids and sediment concentrations during period of streamflow. This impact would be greater when easily eroded soils are located next to waterways. Any large disturbance to channel bottoms could alter the stream courses to some extent.

Maintenance of the transmission line may require vehicular access to the tower sites. Turbidity and sediment load in nearby streams could temporarily increase as a result of possible surface disturbance during maintenance operations. This disruption is considered to be negligible. Routine maintenance repairs are normally required twice per year for each 100-mile segment of transmission line.

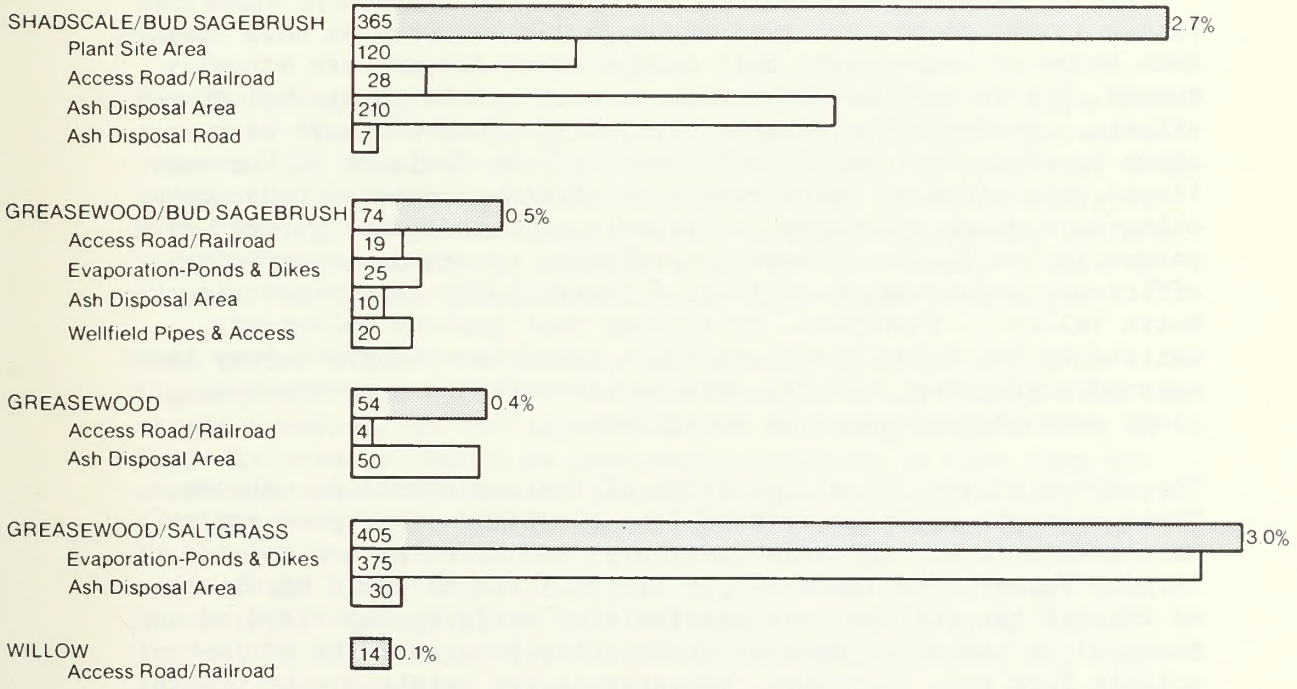
Non-quantifiable secondary impacts on water quantity and quality would occur because of the increased power availability and usage of that power if the power plant and transmission lines are constructed. Any community expansion would provide additional consumers of the available surface waters and groundwaters. Waters would be used to a greater extent for recreational purposes. Community expansion and agricultural irrigation would also impact

the water quality by increasing the amounts of organic matter, sediments, bacteria, salts, pesticides, fertilizers, oil, and grease that would be introduced into the surface waters and groundwaters. The construction of the transmission lines would enhance conditions allowing for future expansion by making additional electrical power available. A complete discussion of secondary impacts which may result from irrigation of new cropland is contained in the Oreana-Hunt Final Environmental Statement (INT FES 77-52), p. 3-48.

Power Plant Complex

Two types of impacts to vegetation would result from power plant construction and operation. One results from construction activity, and would be confined to the project site; the other impact would be production of air pollutants, the effects of which are more widespread.

At the plant site, the major impact to vegetation would be disturbance due to construction activities. Where vegetation is removed or destroyed, disturbance would be considered permanent because of the difficulty of revegetating in the salt desert shrub type. Natural revegetation would likely be in the form of noxious weeds such as halogeton and Russian thistle. These plants would help stabilize disturbed areas against wind and water erosion, but would be of little value for wildlife or livestock. Figure 3-3, p. 3-27 , shows the areas (by vegetative type) that would be affected by construction activities.



ADAPTED FROM "Environmental Report for the North Valmy Station by Westinghouse Electric Corp. for Sierra Pacific Power Company

FIGURE 3-3 — VEGETATIVE TYPES AFFECTED BY PLANT SITE CONSTRUCTION ACTIVITIES By Acres and Percent of Site — 13,460 Acres

Information concerning susceptibility of native vegetation of the southwest deserts and mountains to sulfur dioxide (SO_2) and other pollutants is virtually non-existent (Hill et al., 1974; Fisher 1977). It is known that susceptibility varies greatly among species, so only generalizations can be made based on existing research data. The Environmental Protection Agency's 1973 report on air quality criteria for sulfur oxides indicates that threshold injury to sensitive groups of plants ranges from 0.25 to 2.0 parts per million (ppm) for the two-hour exposure and 0.1 to 1.0 ppm for the four-hour exposure. Hill and associates (1974) have investigated the susceptibility of native species to SO_2 and nitrogen dioxide (NO_2) in the field with similar results. Concentrations of SO_2 above two ppm were required to injure most of the 87 species tested. Calculated levels of SO_2 from Valmy under assumed "worst-case" conditions are below these threshold levels (see the Air Quality section of this Chapter, p. 3-12). Similarly, expected NO_2 levels are below the air quality standard of 0.5 ppm. The visible injury threshold for NO_2 on vegetation is 2.5 ppm over a period of four hours.

Some studies have shown enhanced injury when plants are exposed to a mixture of pollutants (synergy). However, Hill's work failed to show this phenomenon when desert plants were exposed to mixtures of SO_2 and NO_2.

Fisher (1977) points out that although limited studies have been done based on macroscopic cell damage where tissues are actually burned, little work has been done on more subtle physiological effects. According to Fisher, physiological upsets have been shown to occur well before cell burning. He feels it is the continual physiological interference which can eventually cause decline in a plant community. (Fisher's work indicates chronic exposure to low levels of ozone contributes to reduced water-use efficiency and eventual decline of desert holly communities in Death Valley.) Therefore, it appears that gaseous pollutants emitted by the Valmy plant would not cause macroscopic injury to exposed vegetation, but the effects of long-term exposure on plant communities cannot be determined.

The effect of long-term deposition of trace elements is unknown. Trace elements would be emitted from the plant in gaseous and/or particulate form. (Flourine, mercury, and selenium are emitted in both forms. See Table 3-7, p. 3-17 .) Gases would be absorbed through the foliage, and particulates would be deposited on the soil in the area, most of these substances would be in insoluble form and, therefore, unavailable for uptake by the plants. (See Chapter 2, Soils, p. 2-7 , and Figure C-1, p. 10-22 .) According to the Applicant's Environmental Report, neither the gaseous nor particulate forms of trace elements would be detrimental to vegetation due to the relatively small amounts of trace

elements added to the soils, their general unavailability to plants, and the below-average concentrations of these trace elements in the soil of the existing environment.

Calculations summarized in the Soils section, p. 3-6 , also indicate salt deposition from cooling tower drift (an increase in dissolved solid content of the soil of 162 ppm over the life of the plant) would not impact vegetation. The existing vegetation can tolerate salinity levels in excess of 10,000 ppm.

Transmission and Communications Systems

Impacts associated with high-voltage transmission line construction include clearing of vegetation from the tower sites and along the more densely vegetated portions of the right-of-way. Where new access roads are constructed and existing roads are widened, vegetation would also be removed. Other construction activities which do not require actual blading of the soil surface would still result in some trampling and crushing of vegetation. Heavy traffic along unbladed trails such as those connecting the tower sites would virtually destroy the impacted vegetation. Reestablishment of desert shrubs killed in this manner is extremely difficult, primarily due to low precipitation in the area.

Figure 3-4, page 3-30 , shows miles of each vegetative type traversed by the corridors, giving an indication of the vegetative impacts that would be directly sustained along the corridors themselves. Also indicated after each bar in the graph is the estimated acreage of disturbance in each vegetative type due to tower sites, tension stations, and the trail between towers. This estimated vegetative disturbance is 2.42 acres per line mile.

Much more difficult to assess, and in many cases of equal or higher importance, is the disturbance which would result from new access construction and improvement of existing access. The actual disturbance cannot be accurately assessed at this time because the exact location of access is not known. However, an estimate can be made, and is shown in Table 1-14, item 4b, p. 1-42 . Since access needs would be restricted to rough terrain areas, most of the resulting disturbance would be in the northern desert shrub type. Revegetation is difficult in steep terrain areas, increasing the possibility of erosion occurring before the vegetative cover has been reestablished.

In the woodland vegetative type, small numbers of trees in the juniper community would have to be removed from the right-of-way.

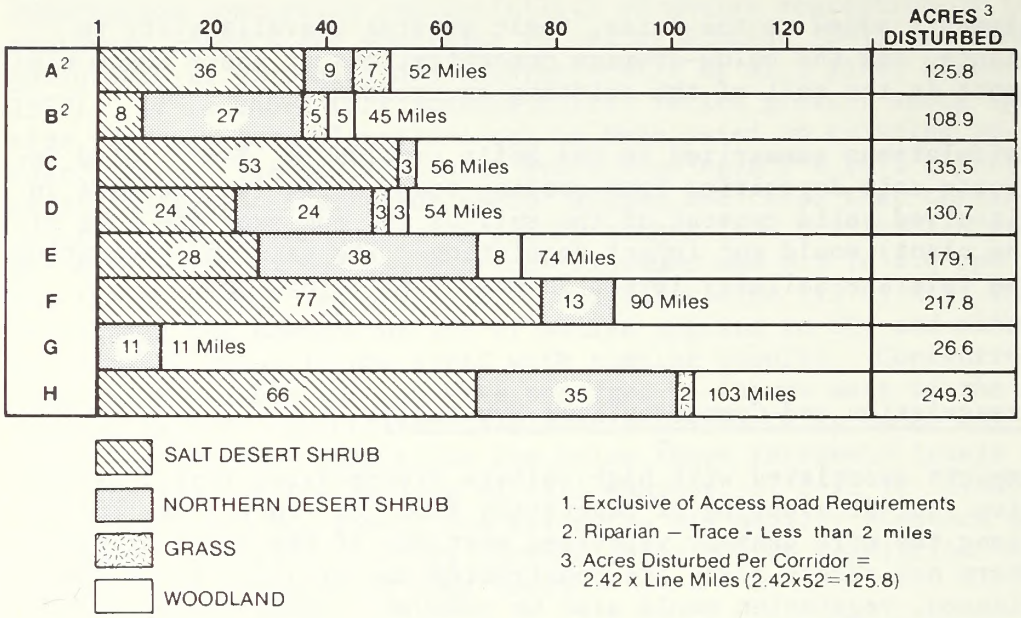


FIGURE 3-4 — MILES IN EACH VEGETATIVE TYPE AND ACRES DISTURBED (by corridor)[1]

The riparian community typically occurs in narrow strips along drainages; therefore, the extent of impacts would be dependent on the angle at which the transmission line crosses these areas. The impacts would be considerably greater if the right-of-way crosses the riparian communities obliquely rather than perpendicularly. The transmission line could easily span riparian areas over most of the routes; however, most of the disturbance in these areas would come from the passage of construction vehicles.

Two opposing factors need to be considered in assessing impacts to the riparian vegetative type. Damage from heavy equipment activity in these riparian areas can be severe; however, wet meadow-stream bank vegetation can be fairly successfully rehabilitated. Because of the minimal amount of riparian habitat within the ES area, any impact to this vegetative type would be significant.

The most sensitive vegetative type traversed by any of the corridors is the salt desert shrub type. Because revegetation in these areas is virtually impossible, any surface disturbance is likely to last for decades. Where vegetation does move into disturbed areas, the result is usually a stand of weed species such as halogeton (which is poisonous to livestock) and pepperweed.

Efforts at revegetation in the other communities can be successful to varying degrees depending on slope, precipitation, soil, and other conditions. It must be remembered a discussion dealing with the success of revegetation efforts in any one region is re-

lative. For example, revegetation anywhere in the ES area would be difficult compared with other areas of the country where precipitation and humidity are higher. Maximum annual precipitation along any of the corridors is less than 20 inches, with average precipitation levels even lower. Therefore, a statement that revegetation is "fairly easy" should be considered with this relativity in mind.

One of the problems associated with revegetation occurs where cheatgrass is abundant. Revegetation techniques in these areas are less successful due to the competitive nature of the grass; usually, the cheatgrass instead of more desirable perennial species spreads into the disturbed areas. Another problem occurs in areas where livestock graze. Tender new plants are generally more desirable forage than the existing plants, and livestock tend to congregate in newly seeded areas, preventing the establishment of the new plants.

Disturbance to vegetation at the microwave sites is expected to be minimal, since five of the seven sites are presently in use, and minimal clearing would be required at the other two sites.

Threatened or Endangered Flora

Potential impacts to threatened or endangered flora can be described only in a general manner because of the lack of definitive data. Construction activities, including road building, vegetative removal, and overland travel could damage or destroy some of these plants. Consultation with the U. S. Fish and Wildlife Service in accordance with Section 7 of the Endangered Species Act has been initiated.

Power Plant Complex

Activities in and around the plant complex could affect one threatened species, Astragalus pterocarpus, which is reported from the floodplain area of the Humboldt River downstream from Battle Mountain. Because no field inventory has been conducted, it is difficult to predict precisely the impact to the species. It is possible that some disturbance to A. pterocarpus colonies has already occurred from well drilling and road construction activities on private land. Alteration of site characteristics (for example, changes in drainage patterns) could also affect this species.

Transmission and Communications Systems

Portions of all the corridors pass near areas where threatened or endangered flora have been reported. (See the Vegetation Map, p. 2-31 , and Table 2-12, p. 2-30 .)

Habitats similar to those supporting threatened or endangered flora are also crossed by portions of each corridor.

The following table relates the corridor segments to the threatened or endangered species which may be affected.

Species	Proposed status[a/]	Segment[b/]
Asclepias eastwoodiana	E	D
Astragalus porrectus	E	E, F, G, H
Elodea nevadensis	E	F
Eriogonum anemophilum	E	E+
Eriogonum lemmonii	E	F
Machaeranthera leucanthemifolia	E	Possibly all segments
Astragalus pterocarpus	T	A, C, E, H
Draba douglasii	T	F, G
Phacelia glaberrima	T	A, B, C, D

a/ E = endangered; T = threatened.
b/ As shown on ES Area Map.

Activities at the seven microwave sites are not expected to affect any threatened or endangered plant species.

Power Plant Complex

Construction of the Valmy generating complex would result in permanent disturbance of the existing vegetation on 912 acres, or seven percent of the total 13,640 acre site. Vegetative areas which would be lost as wildlife habitat include 365 acres of shadscale-bud sagebrush, 74 acres of greasewood-bud sagebrush, 54 acres of greasewood, 14 acres of willow, and 405 acres of greasewood-saltgrass. The loss of habitat would reduce wildlife numbers by an undetermined amount. Animals which would be excluded or lost from the area as a result of construction would include mule deer, cottontail rabbits, coyotes, gray foxes, and porcupines associated with the 14 acres of willow type disturbed; blacktail jackrabbits, least chipmunks, deer mice, and badgers from the greasewood, shadscale, and bud sagebrush types. The low density of wildlife (particularly within the shadscale-bud sagebrush type), and the relatively small percentage of total site disturbed would have a minimal affect on overall wildlife populations.

The disturbance of 14 acres of willow-riparian habitat would reduce habitat available to pheasants, California quail, mourning doves, gray partridges, and approximately 44 species of non-game birds which have been identified as utilizing this habitat type. The number of birds which would be lost from the area is not quantifiable, since some species would only move into similar habitat areas above and below the proposed site, while other species depend on this habitat only seasonally for short periods during migration, and these species would also have similar habitat available outside the area of the proposed project site.

Transmission and Communications Systems

Wildlife would be temporarily displaced during construction of the transmission lines. The extent of displacement would depend upon factors such as the intensity, duration, and season of construction, and the proximity of the transmission line to a particular species habitat. Long-term impacts of transmission line construction would result if habitat were destroyed (removal of vegetative cover) and where access is created into areas previously having no roads. Increased access could result in permanent and/or increased human disturbance to wildlife, e.g., wintering mule deer (January through April) and nesting raptors (late January through May). This disturbance would then result in long-term displacement of wildlife.

Transmission line impacts would be greatest on those species that have a small restrictive home range and/or depend directly on vegetation for food and cover. Transmission line impacts would not significantly affect ES area wildlife populations as a whole, but may have a localized impact on species existing on restrictive and/or crucial habitat, an example being wintering deer.

The physical presence of conductors and towers may be a collision hazard to birds. The span between conductors and the separation between the insulators precludes the possibility of electrocution of large raptors. Placement of transmission towers adjacent to roads may increase indiscriminate shooting of perching raptors. In treeless areas towers may be utilized by raptors as hunting perches, which would increase the size and configuration of hunting areas presently utilized and also increase the influence of raptors on the prey-species habitat.

Transmission line construction disturbance to existing vegetation may create a subclimax vegetative community which would be conducive to an increase in rodent populations. Prey-species numbers would be increased for those predators which predominately prey upon rodents.

Transmission line construction activities in proximity to raptor eyries could disturb nesting raptors, resulting in abandonment of the nests. (See the Waterfowl, Fisheries, and Raptor Map, p. 2-45 .)

Streams and their associated riparian habitats would be traversed by the proposed transmission lines. Siltation levels may increase within those rivers and streams, although this impact would be of short duration. Increased siltation may stress fish populations (breathing restriction), but would not cause permanent damage to fish populations or other aquatic biota. Possible levels of siltation are discussed in the Water Quality section of this Chapter, p. 3-23 .

Human activity associated with transmission line construction in the vicinity of streams and/or other aquatic habitats may cause disturbance to nesting waterfowl and other water-associated species. (Nesting activity occurs from April to June.)

Potential impacts to wildlife species due to transmission line construction are quantified in Table 3-9, p. 3-35 , by number of acres disturbed and by miles of a particular species habitat crossed by the line. The three wildlife maps in Chapter 2 show the transmission line corridors and wildlife habitats affected.

TABLE 3-9
WILDLIFE IMPACTS--TRANSMISSION LINE CONSTRUCTION

Transmission line segment		Big game							Upland game birds			
		Mule deer Range				Reintroduction						
		Yearlong	Summer	Winter	Key winter	Pronghorn antelope	Bighorn sheep	Mountain lion	Chukar partridge	Valley quail	Sage grouse	Ring-necked pheasant
A	miles			10					6	6	2[b/]	6
	acres			24					16	16	5[b/]	16
B	miles	3	2		4	12		19	10		32[b/]	
	acres	7	5		10	29		46	24		77[b/]	
C	miles			2					4	3		
	acres			5					10	7		
D	miles					28		11		1	2	
	acres					68		27		3	5	
E	miles		3	29			11	16	30	17		2
	acres		7	70			27	39	73	41		5
F	miles	6		4			16		28	14		3
	acres	16		10			39			34		7
G	miles	14							12	1		
	acres	34							29	2		
H	miles	5		8				36	45	16		2
	acres	12		19				87	109	39		5

a/ Wildlife impacts--linear miles and acres impacted by transmission line construction and operation.

b/ Strutting ground.

Valmy to Mira Loma Corridor (Segments E, F, G, and H)

The primary impact on big game species of this proposed transmission line would result from construction activity causing physical disturbance to habitats. The proposed transmission line route would impact mule deer winter range along the southeast extent of Buffalo Mountain and in the southern portion of the Sonoma Range.

Human activities associated with transmission line construction could adversely affect local populations of mule deer by excluding them from normal use areas, particularly during the winter months of peak stress. Because of the extensive acreage of existing mule deer habitat (as shown on the Big Game Map, p. 2-41), the potential loss of 150 to 175 acres of big game habitat (depending on the corridor selected), would not significantly affect overall mule deer populations. Mule deer winter and summer ranges would be affected in the East, the Humboldt, and the Pah Rah Ranges, as would the yearlong range along the Humboldt River and south of the Truckee River. Based on the estimated mule deer per square mile density in occupied habitats, the loss of habitat represents a long-term loss of one to three animals.

Mountain lion range would be affected by construction activities associated with the transmission lines, and would also be affected by the improved access resulting from construction of the transmission line. Increased human disturbance could exclude mountain lions from customary hunting and use areas in the East and Humboldt Ranges, although the large areas available for mountain lions would make the potential impacts less significant.

The Humboldt and Truckee Ranges have been identified as proposed bighorn sheep reintroduction sites by the Nevada Department of Fish and Game. The proposed transmission line would impact both of these ranges (increase human disturbance). Table 3-9, p. 3-35, shows linear miles and acres of habitat for big game species which would be impacted.

Construction of the transmission line would disturb upland game habitat through loss or modification of vegetative cover and through increased human activity during and after construction.

The transmission line would traverse, or would be in proximity to, three known raptor concentration areas. Raptor concentration areas and transmission corridors are shown on the Waterfowl, Fisheries, and Raptor Map, p. 2-45 . In addition to these known concentration areas, the valleys of the ES area are utilized by golden eagles and rough-legged hawks as wintering areas. The Upper Valley that surrounds Lovelock is also used as a wintering area by raptors.

Aquatic animal life and habitat may temporarily be impacted at the two transmission line crossings of the Truckee River and at one transmission line crossing of the Humboldt River. Riparian vegetation may be destroyed or disturbed to the extent that siltation would be increased. The degree of impact would depend on the amount of disturbance at these sites. Construction activity within or near aquatic environments would disturb nesting waterfowl and other water-associated species. Waterfowl areas, fisheries, and transmission line corridors are shown on the Waterfowl, Fisheries, and Raptors Map.

Valmy to Austin Corridor (Segments A, B, C, and D)

Segment A of the Valmy to Austin corridor would impact mule deer yearlong range along the Humboldt River. This corridor would also cross the periphery of mule deer winter range on the west side of Battle Mountain. No impacts to wintering or yearlong deer habitat would be anticipated in this area due to the relatively small areas crossed by the proposed transmission lines.

Depending on the exact location of Segment A, a sage grouse strutting ground west of Battle Mountain may be impacted. (See the Upland Game Bird Map, p. 2-43 , for the location of the strutting ground and the proposed corridor.) Construction activities in this area could result in physical disturbance to the strutting ground and could pose a collision hazard for birds moving to and from roosting areas to the strutting ground. Construction activities may displace birds during the strutting period (early March to mid-May), as would the increased human activity associated with access improvement.

A transmission line in proximity to the strutting ground could be utilized by raptors as a hunting perch, which could result in increased predation on sage grouse. The potential numbers of sage grouse lost to increased predation is not quantifiable.

Transmission line construction would disturb chukar partridge and valley quail habitat on the west side of Battle Mountain. Waterfowl, ring-necked pheasant, and valley quail habitat may be disturbed as a result of construction activity where Segment A would cross the Humboldt River.

Aquatic animals and habitat may temporarily be impacted at the A Segment crossing of the Humboldt River. Riparian habitat may be disturbed to the extent that the amount of suspended solids (siltation) entering the Humboldt River would be increased. This may cause stress to fish (breathing restriction), but is not considered significant when the additional amount of suspended solids entering the river is compared with the amount naturally occurring in the river.

Segment B is in proximity to two raptor concentration areas located on the west extent of the Shoshone Range north of the Cedars. The Reese River Valley in general is utilized by golden eagles as a wintering area. Raptor concentration areas and the transmission line corridors are shown on the Waterfowl, Fisheries, and Raptor Map, p. 2-45 .

The B Segment would impact three streams: Boone Creek, Silver Creek, and Italian Creek. Crossing of the stream by the transmission line may increase siltation, and stress aquatic animals. This impact would be temporary, but could become long-term if vehicle crossings used for line construction are not "put to bed" and thereby become permanent crossings.

Similar impacts to those described for the strutting ground west of Battle Mountain may occur to the strutting grounds located near the proposed Segment B. One strutting ground is located west of Iowa Creek and the other south of Italian Creek. (See the Upland Game Bird Map, p. 2-43 .)

Segment B would impact mule deer summer and crucial winter range in the Cedars area. Mountain lion habitat is also within this area; however, other than temporary displacement during construction, no impacts are anticipated.

Carico Lake Valley has been identified as a pronghorn antelope reintroduction site (see the Wildlife section of Chapter 2, p. 2-37); and Segment B would cross the southern end of this valley, disturbing approximately 29 acres of habitat. (See Table 3-9, p. 3-35, for linear miles and acres of habitat potentially impacted for

the individual big game species discussed. Big game habitats and corridor locations are shown on the Big Game Map, p. 2-41 .)

The D Segment of the corridor could impact valley quail habitat designated along the eastern portion of Fish Creek. Sage grouse habitat northwest of Austin would be impacted by transmission line construction. Waterfowl and waterfowl habitat may be temporarily disturbed where the Segment D traverses the Reese River northwest of Austin.

The sage grouse habitat west of the Toiyabe Range and north of Austin would be impacted by physical disturbance to the habitat. Chukar partridge habitat would be disturbed in the Cedars, and possibly along the west side of the Toiyabe Range north of Austin.

Segment D of the corridor would cross mountain lion range in the Shoshone Mountains northwest of Austin. No impacts are anticipated other than temporary displacement during construction. It has been considered that habitat suitable for reintroduction of pronghorn antelope may exist in Antelope Valley. Segment D borders the east side of this valley, and transmission line construction would disturb approximately 48 acres of potential habitat.

Segment D would have no impact on fisheries.

The installation of equipment at the communications sites would have an insignificant impact on wildlife. Five of the seven sites to be utilized are presently in use, and additional development would be minimal.

Threatened or Endangered Species

The American peregrine falcon, Falco peregrinus anatum, is listed as an endangered species (Federal and State), and is occasionally sighted within the ES area during the winter and during spring and fall migration. The peregrine falcon does not nest within the ES area.

The northern bald eagle, Haliaeetus leucocephalus, which winters in the ES area, is currently under consideration for inclusion on the Secretary of the Interior's list of endangered species. The southern bald eagle, Haliaeetus leucocephalus leucocephalus (an endangered species), is recognized as occurring only south of the 40th parallel, which would include the southern half of the ES area.

The Lahontan cutthroat trout, Salmo clarki henshawi, is listed as threatened species and is found within the Humboldt River drainage.

The State of Nevada Board of Fish and Game Commissioners has classified the peregrine falcon as an endangered species within the State of Nevada, while the spotted bat, Euderma maculatum, whose range includes the ES area, is classified as a rare species.

The proposed power plant and associated transmission lines would be unlikely to impact any threatened or endangered species due primarily to their low frequency of occurrence within the ES area and the relatively small land area potentially affected by the plant and transmission lines. Consultation with the U. S. Fish and Wildlife Service in accordance with Section 7 of the Endangered Species Act has been initiated.

WILD HORSES

There are no wild horses within the proposed project site area: however, transmission line construction activity would result in some temporary displacement of wild horses which range widely over the areas crossed by the proposed routes in small bands of 5 to 15 animals. Construction of the Valmy to Mira Loma segment would cause temporary displacement of horses ranging in the southern portion of the Sonoma Range, the northern extent of the Tobin Range, the East Range, the Humboldt Range, the Truckee Range, and the southern portion of the Pah Rah Range. Construction of Segment C of the Valmy-to-Austin Corridor would not result in any temporary displacement of wild horses. Construction of the Segment D of the Valmy-to-Austin Corridor would temporarily displace wild horses ranging in the northwestern portion of the Shoshone Mountains and eastern extremity of Antelope Valley. Construction of Segment B of the Valmy-to-Austin Corridor would temporarily displace wild horses ranging in the southern portion of the Shoshone Range and west-central extent of the Toiyabe Range. Construction access roads that are not rehabilitated ("put to bed"), and those roads remaining for future maintenance access may influence the extent or configuration of a particular herd's home range. The usual consequence of increased access is increased human activity, which may result in a permanent displacement of wild horses. These impacts are not significant when the large unrestricted areas occupied by these wild horses is considered. (Refer to the Wild Horse Map, p. 2-49 .)

Disturbance of wild horses during the foaling period (primarily April to May) could result in additional stress to newborn foals and possible abandonment. The displacement of horses from their established home range areas could increase interaction and associated aggressiveness between dominant studs of separate herds. The overall effect of possible displacement and associated interactions (aside from foal abandonment) is not known. In light of the large areas of habitat available and the relatively small acreages affected by construction activities, impacts would be insignificant. (See Table 3-10.)

TABLE 3-10
WILD HORSE HABITAT

Transmission line segment[a/]	Miles	Acres per mile of disturbance	Acres of habitat disturbed[b/]
B	8	2.42	19.36
D	40	2.42	96.8
E	46	2.42	111.32
F	20	2.42	48.4

a/ Wild horse habitat is not crossed by the other segments.

b/ Total acreage of wild horse habitat is approximately 2,403,791 acres.

Land Characteristics

The proposed plant and associated developments would occupy 912 acres of the 13,640 acre project site. The surrounding private lands which would be required by the Applicant as a "buffer" area would be returned to the original private owners through subletting.

Because of the linear aspect of the transmission lines, they have the potential of impacting many land uses. Agricultural stock grazing and recreation are the two principal land uses. Since these primary uses are extensive rather than intensive, impacts resulting from transmission line construction are expected to be minimal.

Planning and Zoning

Federal

No conflicts have been identified between the proposed action and any Federal agency plans. The routing of the transmission line between Valmy and Mira Loma would conform to the provisions of Section 503 of the Federal Land Policy and Management Act of 1976 concerning the use and designation of right-of-way corridors. There is a highway, but no existing utility corridor between Valmy and Austin. Construction of the proposed transmission line could establish a utility corridor in this area.

State

In a letter from the Nevada State Clearinghouse dated January 30, 1976, the statement was made that it was a Nevada State policy that transmission lines should be consolidated into existing corridors. As mentioned above, the proposed routing of the Valmy to Reno line conforms to this concept.

Counties and Local Governments

There would be no conflicts between the proposed action and any county or local government plans.

Agriculture

Crop Production

The impacts on existing agriculture from the construction of the generating station and transmission lines are expected to be minimal. Impacts would include land taken out of production by the proposed facilities, interference with sprinkler systems and other farming operations, and possible air pollution damage to crops. Since croplands occupy a small portion of the ES area, disturbance would be minimal.

Calculated values for plant emissions indicate the quantities of pollutants found in agricultural areas would be below the threshold level required for damage to vegetation. (See the Vegetation section of this Chapter, p. 3-27 .)

More important than the possible impact to existing farmlands is the relationship of increased power availability to potential agricultural development. With the existence of new sources of reliable and continous power located in an area where the availability of electrical power has been one of the limiting factors in agricultural development, it is expected that those lands would be developed where agricultural water appropriations have been made by the Nevada Department of Water Resources. (See Chapter 2, Land Uses--Agriculture, p. 2-52 . Impacts associated with increased agricultural irrigation are discussed in the Water Quality section of this Chapter, p. 3-23 .)

Livestock Grazing

Loss of vegetation at the station site, evaporation ponds, access roads, transmission line tower sites, storage yards, and conductor-wire stringing sites would reduce total available livestock forage, but would have little effect on grazing. According to the Battle Mountain BLM District Office, the partial loss of this vegetation through disturbance by construction activities would have no real effect on existing grazing programs. The following table indicates the approximate loss of forage, in animal unit months (AUMs) for the plant site and corridor segments. Compared with available AUMs, this loss is insignificant. (The carrying capacity of the area varies from 8 to 50 acres per AUM. See p. 2-52 .)

Plant site	A[a/]	B	C	D	E	F	G	H
45.6	6.3	7.7	6.1	8.2	10.7	12.6	3.6	9.6

a/ Letters refer to corridor segments as shown on the ES Area Map, p. 1-11 .

Mineral Activities

Power Plant Complex

The construction and operation of the North Valmy generating station and related plant facilities would have no impact upon known mineral values. The plant site has no valuable mineral deposits, and there is no mining activity in the immediate area.

Transmission and Communications Systems

The construction of transmission lines would have no impact on known mineral values or on current mining activity. (See the Minerals Maps, Appendix C, p. 10-23 .) Avoidance of mining claim areas was a consideration in the selection of the various corridors under study. Corridor Segments A and C circumvent the mining activity in Battle Mountain. Since each corridor is two miles wide, a right-of-way could be placed within a corridor so as to minimize any conflict with existing mining claims. Line location near an area of underground mining operations would not pose severe problems as the towers could be located to avoid shaft and tunnel areas and their associated above-ground tailings.

Construction and operation of the various microwave relay facilities would have no impact on mineral activities.

Transportation Systems

During peak construction periods, approximately 150 workers would have to be housed in nearby communities. At the beginning and end of each working day there would be up to 150 vehicles using the Stone House interchange for access to the construction or to Interstate 80. Moderate delays and traffic congestion would be expected to occur as a result.

Most of the transmission line corridors cross or parallel major highways. (See Table 3-11, p. 3-44 , for a listing of highway crossings for each corridor segment.) Several of the segments parallel and/or cross the railroad tracks. Upon leaving the plant complex, corridors A, C, E, and H cross the Southern Pacific Railroad tracks. Segment H crosses the railroad near Oreana and near the Tracy power station. Rail traffic increases resulting from the proposed project are estimated to be three trains per unit per week. (See p. 1-20 .)

TABLE 3-11
AVERAGE DAILY TRAFFIC AT CORRIDOR-HIGHWAY CROSSINGS

Corridor	Highway	Location	Average daily traffic[a]/
A	I-80	Near Stone House Interchange	3,640
B	N-8A	Reese River Valley near the Cedars	135
C	I-80	Near Stone House Interchange	3,640
D	N-8A	North of Austin	200
E	I-80	Near Stone House Interchange	3,640
F	I-80	Near Oreana	4,265
	N-34	North of Wadsworth	700
	I-80	Tracy Power Station	8,050
G	--		
H	I-80	Near Stone House Interchange	3,640

a/ Source: Nevada Highway Department, 1976 Annual Traffic Report.

Utilities

The power plant and associated transmission lines would add to the western states power grid under the umbrella of the Western States Coordinating Council. Construction of the power plant and transmission lines is not expected to impact other utilities in the area.

The transmission line from Valmy to Reno would parallel a 345 kv transmission line already proposed by Sierra Pacific Power Company. (Intertie #2 from Tracy, Nevada, to Hunt, Idaho, which as been analyzed in the Oreana-Hunt Final Environmental Statement.) A portion of Intertie #2 from Tracy, Nevada, to Oreana, Nevada, has already been completed and energized.

An estimated 50 miles of the existing Tracy to Oreana transmission line (Intertie #2) parallels a buried gas pipeline, with a separation of 1,000 feet from the pipeline. (Southwest Gas Corporation has indicated that induced voltages in the gas line caused by a closely parallel transmission line would be hazardous to human and animal health.) The same condition would apply to that portion of this proposed transmission line which would pass in proximity to the gas line.

Power Plant Complex

Recreation opportunities now available on public lands at the plant complex would be eliminated or restricted upon acquisition of the property by the Applicant. Public access would not be allowed on acquired plant site property for hunting, fishing, rockhounding, or vehicle camping unless specified in leases granted by the Applicant for agriculture, grazing, or other similar uses. (Applicant's Environmental Report, p. 7-65.)

A small number of off-road vehicle (ORV) users are known to frequent the project site area and, should the proposed project be approved, these ORV users would no doubt consider closure of 13,640 acres to public use as a loss of opportunity.

Since the number of recreation visits per year for activites available within the plant site area are consistently less than one-one hundredth of one percent (< 0.01) of the estimated 15,000 visits per year in the affected area, the loss of opportunities due to the proposed action would appear to be insignificant. The lack of important outdoor recreation resources and apparent extremely low level of use at the plant site contribute to the conclusion that no significant impacts to recreation resources would result from the proposed action.

Transmission and Communications Systems

Construction activities, although short-lived at any one location (along the finally selected corridors) would effectively render temporary work areas unusable for public recreation. Sightseeing, ORV use, hunting, and camping would not be as enjoyable in the proposed corridors during construction of the transmission lines. These activities are not specifically site-dependent and can be dispersed over a variety of areas. If one location is temporarily unusable due to construction activities, another area may be substituted. Although they cannot be quantified, recreation opportunity losses due to construction activities are expected to be minimal. Hunting occurs during limited seasons in fall and early winter, and most camping and off-road vehicle use is directly associated with hunting trips.

There would be some potential for diminishing the availability or quality of feature and historical sightseeing, photography, vehicle travel, rock and mineral collecting, and pine-nut gathering; for example, they cannot always be easily shifted to other locations if the site they depend upon were to be temporarily unusable due to construction activity.

The aesthetic impacts of man-made intrusions (such as transmission lines) by their nature are subjective, and as such are difficult to quantify. They generally depend on the attitude and opinions of the recreationist which can range, in the case of transmission lines, from admiration of an engineering accomplishment to total rejection of the project's perceived interference with recreational experiences. Any significant increase in blowing dust, noise, exhaust fumes, or smoke resulting from construction and/or maintenance operations would reduce sightseeing opportunities and generally detract from enjoyment of the natural surroundings.

Table 3-24, p. 3-72 , details potential impacts to the recreation resource resulting from construction of the proposed transmission line and from construction of the power plant.

WILDERNESS

The two potential Wilderness Study Areas discussed in Chapter 2 (Cedars-Elephant Head and Manhatten Mountain) will be the subject of an accelerated wilderness characteristics evaluation (with full public involvement) to determine if these areas do or do not meet the criteria in Section 2(c) of the 1964 Wilderness Act and if they should be designated as Wilderness Study Areas by the BLM. If the analysis shows that these areas do not have wilderness characteristics, then the proposed action would not be expected to impact any wilderness resources of the public lands. Should the wilderness characteristics evaluation result in designation of Wilderness Study Areas, a complete study will be conducted and a report submitted to the President as to their suitability or non-suitability for inclusion in the National Wilderness Preservation System.

Wilderness Study Areas, or those public land tracts over 5,000 acres meeting the criteria of Section 2(c) of the 1964 Wilderness Act, will be managed during the period of review and until Congress has determined otherwise, in a manner so as not to impair their suitability for preservation as wilderness. Should either area identified in this Draft Environmental Statement as having apparent wilderness values become a Wilderness Study Area, the proposed action would necessarily be modified to avoid any impairment of wilderness preservation suitability.

Mitigating measures which would prevent impacts to wilderness resources are outlined in Chapter 4.

An alternative route for that portion of Segment B through "The Cedars" is described in Chapter 8.

Paleontological Resources

The construction, operation, and maintenance of the power plant complex, transmission lines, and microwave stations would not impact any known paleontological localities.

Arachaeological and Historical Resources

Construction of the proposed power plant would result in the destruction of 16 archaeological sites (including seven with subsurface material), through both surface and subsurface disturbance. If the proposed action is approved, transfer of the required public lands to the Applicant would remove from Federal protection eight additional archaeological sites, including one with significant subsurface material. One historic temporary railroad or highway construction camp would also be lost.

Loss of the prehistoric sites would be particularly significant, since these sites are associated with the Humboldt River, which is a relatively unusual micro-environmental setting. Modern human activities have been concentrated along this river resulting in a higher rate of site loss in this particular setting, reducing the probability that scientific information preserved on these sites would be duplicated elsewhere.

Indirect impacts in both the plant site area and along the transmission lines might result from collection of antiquities by persons associated with construction activities. Construction of new access routes along the transmission lines might also contribute to increased vandalism, although most areas involved are already accessible. In a more general sense, the increased population resulting from project construction and operation would probably contribute its share toward depletion of nonrenewable resources.

Direct impacts along power transmission lines would result primarily from constrcution of access roads and tower placement. Visual impacts on the Austin Historic District are also of concern, since any transmission line terminating at the Austin substation would be visible from that National Register District. The Rochester Historic District does not fall within the two-mile wide corridor and is hidden from the corridor by an intervening ridge. No impact on this area is anticipated.

Specifics, such as the number of sites to be disturbed and the number of miles of transmission line visible from National Register proper-

ties, cannot be evaluated until the exact locations of the towers and lines have been identified.

Five of the seven proposed microwave communications facilities would be located on previously developed sites. No serious conflicts with cultural or paleontological resources are anticipated.

Power Plant Complex

The proposed power plant would be a prominent industrial intrusion into a basically rural landscape. The existing landscape can be generally characterized as "low-profile," i.e., most natural features tend to be horizontal in appearance, giving the impression of being drawn out and extended across the horizon lines. The power plant would not easily blend into the low-profile landscape due primarily to the strong vertical contrast of the structures, particularly the 500-foot stacks.

The degree of contrast (visual impact) of the proposed plant would vary according to the position of the observer (distance from the plant), season, and time of day. Basically, visual impacts would increase with proximity to the plant complex.

When not actually obstructed by land features, the plant complex could be visible from up to 10 miles away. The plant complex would be located approximately four miles from Interstate 80 (I-80) and would be visible for several minutes to an estimated 3,600 persons per day traveling along I-80. Strobe lights on the stacks would tend to attract attention to the plant complex.

The panoramic character of the landscape would permit a relatively long-term viewing of the plant complex, resulting in a high visual impact. The complex would add variety to the existing landscape character and would change the aesthetic experience of the public. The cumulative visual contrast created by the plant would be high. Additionally, surface disturbance and removal of vegetation for construction would change the landscape character. Visibility impacts associated with the power plant stack emissions are discussed in the Air Quality section of this Chapter, p. 3-12 .

Transmission and Communications Systems

The contrast that would result from transmission line development would be caused by right-of-way clearing, access and maintenance, road construction, tower site construction, construction of staging areas, and the presence of the towers and conductors themselves. The transmission lines would be visible to several thousand travelers on I-80 and Highway 8A. (See Table 3-11, p. 3-44 .)

Access roads, tower site surface disturbance, and removal of vegetation could constitute more visually prominent intrusions in some cases than would the transmission line towers. (Experience with the Tracy to Oreana 345 kv line indicates that the towers are highly

visible). Clearance of the roadway and tower sites would result in a sharp demarcation in texture and color of the exposed soil and surrounding vegetation.

Because of their height and the reflectivity of aluminum, transmission line towers would constitute a visually prominent feature when superimposed over low-growing vegetation, or when skylined on high topographic features. The towers would project a rigid unnatural appearance in medium to major contrast to the form and lines expressed in the natural landscape.

The use of the lattice-style, shiny aluminum towers would create additonal contrast (reflections) as would the size and unnatural character of the towers themselves. Since the transmission line towers would be two to three times higher than other man-made features in the landscape, they would command the attention of the viewer. The specific points of critical contrast (road construction, skylining, and highway crossings) are shown on the Visual Impacts Map, p. 3-53 , and are summarized in Figure 3-5.

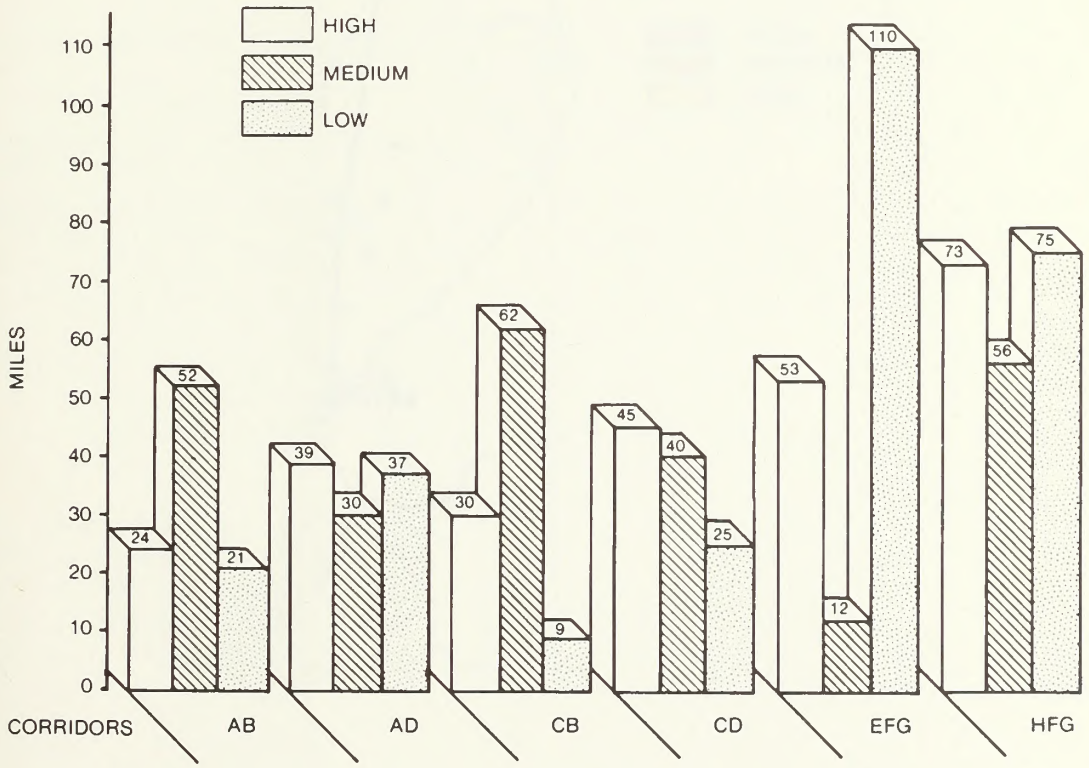


FIGURE — 3-5 DEGREE OF VISUAL IMPACT

Visual impacts from development of the microwave communication system are expected to be minimal. Of the five sites located on elevated terrain, four have existing access and are currently in use for other communications facilities. The one which does not have access or existing facilities is the Passive Antenna site in Washoe County. This location is on private land and would be developed by use of helicopters, thus eliminating the need for access construction.

MAP AREA

NEVADA

N

HIGH
MEDIUM
LOW

NORTH VALMY PLANT SITE

Oreana Substation

MIRA LOMA SWITCHING STATION

Tracy Station

AUSTIN SUBSTATION

A
B
C
D
E
F
G
H

10 0 10 20 30 40
MILES
10 0 10 20 30 40 50
KILOMETERS

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

NORTH VALMY POWER PROJECT

VISUAL IMPACTS

1977

Service Area

The Applicant has projected that an adequate power supply should not restrict population growth within the Service Area, a statement with which the Nevada Public Service Commission has concurred. The service and trade industries should continue to expand employment opportunities for semi-skilled and skilled labor.

One impact of the availability of new electrical power which is extremely difficult to substantiate is whether the available new power is actively growth-inducing or whether it is a more passive impact, providing a potential for growth. Indications are that the Reno-Sparks-Lake Tahoe area will continue to grow as long as people find the area's working and recreational environments desirable.

Environmental Statement Area

Population Characteristics

According to population estimates and the number of construction and operation workers needed for the proposed North Valmy project, Lander County would have an additional 10 percent growth in its population by 1980. This is more severe (12 percent) with respect to locality, since it would be primarily within the confines of the community of Battle Mountain rather than dispersed throughout the county. As depicted in two previous studies (Mackay, "Costs for Rural Community Services in Nevada"), a general conclusion is that provisions for public services in Lander County would be strained and may break down under such an influx of new population. This could represent a severe impact on local community services and planning. (See Table 3-12, p. 3-56 .)

The population impact on public services would be less severe in Humboldt County, with its larger population base. (See Table 3-13, p. 3-56 .) Winnemucca would incur an additional 10 percent growth in population by 1980 due to construction and operation personnel and their families.

Population expansion directly related to plant construction and operation is expected to peak in 1981 at 819 persons (Table 3-14, p. 3-57). The single largest population expansion is anticipated to occur from 1979 to 1980 with the largest decline occurring from 1984 to 1985. These are two critical periods for the communities of

TABLE 3-12
LANDER COUNTY AND BATTLE MOUNTAIN POPULATION
ESTIMATES AND PROJECT WORK FORCE

Population component	1975	1980	1985	1990	2000
Lander County:					
Base population[a/]	3,281	3,382	3,487	3,594	3,820
Battle Mountain:					
Base population[a/]	2,236	2,700	2,790	2,875	3,056
Construction[b/]	--	290	45	--	--
Operation[b/]	--	42	121	145	145
Total	2,236	3,032	2,956	3,020	3,201

a/ University of Nevada, Bureau of Business and Economic Research, Revised March 1977 Nevada Population Projections.

b/ Applicatn's Environmental Report.

TABLE 3-13
HUMBOLDT COUNTY AND WINNEMUCCA POPULATION
ESTIMATES AND PROJECT WORK FORCE

Population component	1975	1980	1985	1990	2000
Humboldt County:					
Base population[a/]	7,161	8,001	8,706	9,243	10,696
Winnmucca:					
Base population[a/]	3,994	4,481	4,875	5,176	5,990
Construction[b/]	--	400	119	--	--
Operation[b/]	--	70	247	315	315
Total	3,994	4,951	5,241	5,491	6,305

a/ University of Nevada, Bureau of Business and Economic Research, Revised March 1977 Nevada Population Projections.

b/ Applicant's Environmental Report.

Winnemucca and Battle Mountain, which must respond to population expansion and contraction. The impact would be more severe when secondary employment indirectly related to the proposed project is considered. Impacts to local Indian populations are not expected to differ from those projected for the population in general.

TABLE 3-14
PROJECT CONSTRUCTION AND OPERATION EMPLOYMENT
POPULATION AND SECONDARY EMPLOYMENT POPULATION

Year	Construction[a]	Secondary[b]	Operation[a]	Secondary[b]	Total
1977	91	30	--	--	121
1978	205	77	--	--	282
1979	393	152	--	--	545
1980	679	264	94	37	1,074
1981	642	250	177	65	1,134
1982	491	190	177	65	923
1983	566	220	177	65	1,028
1984	453	175	193	73	894
1985	91	30	193	73	387
1986	--	--	193	73	266
1987	--	--	193	73	266

a/ Applicant's Environmental Report.

b/ Secondary population based on secondary employment shown in Table 3-15, plus family characteristics derived from information in the Applicant's Environmental Report.

Employment Characteristics

The employment characteristics of Humboldt and Lander Counties (discussed in Chapter 2, p. 2-80) would generally be continued throughout the construction and operational phases of the proposed project. Since most of the workers (estimated at 70 percent in the Applicant's Environmental Report) would be non-local, changes in local employment characteristics should not be affected. This criterion would hold as long as these non-local workers did not change the industrial complexion of the local communities where they would reside. (See Table 3-15, p. 3-58 .)

Basic employment would also generate "secondary" employment, i.e., jobs generated to serve the needs of the basic employees.

TABLE 3-15
ANNUAL PEAK CONSTRUCTION AND OPERATIONAL EMPLOYMENT, EMPLOYMENT MULTIPLIER, NORTH VALMY STATION

Year	Construction	(Multiplier)	Operation	(Multiplier)	Total construction-operation	Total multiplier	Total
1977	60	23	--	--	60	23	83
1978	135	52	--	--	135	52	187
1979	260	101	--	--	260	101	361
1980	450	175	30	12	480	187	667
1981	425	166	55	21	480	187	667
1982	325	126	55	21	380	147	527
1983	375	146	55	21	430	167	597
1984	300	117	60	23	360	140	500
1985	60	23	60	23	120	46	166
1986	--	--	60	23	60	23	83
1987	--	--	60	23	60	23	83

Source: Applicant's Environmental Report. Multiplier data from Nevada State Engineer's Office, Water for Nevada. (Special Report: Input-Output Economic Models.)

An employment "multiplier" is the average number of secondary (and basic) jobs expected to result from the creation of the average basic job. In order to arrive at the employment multipliers and their projections, a large number of factors are considered; for example, type of employment, level of planning expected to encourage growth, and the possibilities of economic development in the communities.

In 1980-1981 additional employment induced by the proposed project would peak at 187. A total of 667 jobs could be related to the proposed project during these two years of peak employment.

The number of jobs would outstrip the local labor market supply during the construction phase of the proposed project, based on population projections and employment characteristics without the proposed action. "Secondary" employees would necessarily come from outside Winnemucca and Battle Mountain. The Elko and Reno-Sparks areas would provide the additional labor supply during this period (based on proximity to the impact area and size of population).

Income and Expenditures

Income derived from wages and salaries is broken down into direct and indirect income. Direct income is the increase in spendable income in the form of wages and salaries paid to the construction and operation labor force. Construction labor would receive an average of $20,000 per year and operational labor $15,000 per year in salaries (Applicant's Environmental Report). These estimates reflect gross income (net income of $15,000 or $20,000 plus federal taxes) for each of the selected years. (See Table 3-16.)

TABLE 3-16
GROSS PERSONAL INCOME
(THOUSANDS OF DOLLARS)

Year	Construction	Operation	Total
1977	$ 1,277	$ -0-	$ 1,277
1978	3,035	-0-	3,035
1979	5,895	-0-	5,895
1980	10,303	528	10,831
1981	9,679	1,050	10,729
1982	7,128	1,146	8,274
1983	8,214	1,211	9,425
1984	6,458	1,395	7,853
1985	1,098	1,491	2,589
1986	-0-	1,661	1,661
1987	-0-	1,728	1,728

Source: Applicant's Environmental Report.

Income multiplier effects would create additional local income greater than the direct stimulus from the project. Direct and indirect income generation includes purchases by the project labor force stimulating local merchants to purchase and sell additional goods and services. The income multiplier for new construction at 1.2502 (Water for Nevada - Special Report: Input-Output Economic Models) means that there will be an additional 25 cents in economic stimulus from each dollar spent in the region.

It is estimated that Humboldt County would receive approximately 70 percent of all revenues as a result of the relatively more developed service industry of Winnemucca (Applicant's Environmental Report). Long-term annual sales should exceed $800,000 in Humboldt County and $400,000 in Lander County. The percentage distribution among retail components in each county is assumed to remain the same. Food, general merchandise, and automotive sales would account for more than 50 percent of total sales. (Table 3-17, p. 3-61 .)

Government Finance and Taxation

Impact assessment is most critical with regards to what public services can be provided with the existing tax base plus additional revenues derived from new projects. The North Valmy project, with the additional work force and their families, should increase public service needs for both the Winnemucca and Battle Mountain areas.

The "bottom line" surplus of deficit revenue and expenditure data presented in this section are a direct result of tax payment allocations of two levels of organization. (See Table 3-18, p. 3-62 .) First, Sierra Pacific's tax payments are only those which are allocated to Humboldt and Lander Counties according to distribution by total existing transmission line miles. Humboldt County would receive approximately $14,000 per year while Lander County would receive approximately $70,000 to $82,000 per year. (See Table 3-23, p. 3-70 .) Second, the internal allocation of taxes within the counties directly affects the balance of individual budgets. For example, a surplus or deficit in a county budget is a function of the percentage of total tax payments internally allocated to that particular budget. A deficit there would not exclude the possibility of a large surplus in another district which would overcome the negative balance, given a reallocation among budgets.

Prior to completion of the power plant, the Public Service Commission gave permission to Humboldt County to assess Sierra Pacific on the project work as it was completed, with the stipulation that once the plant is on-line, normal taxing procedures (line mile tax) would begin.

Humboldt and Lander Counties are currently (1977) working on an agreement wherein the counties would share in the property tax revenues accuring to the construction phase of the proposed project. Final

TABLE 3-17
ESTIMATED TOTAL RETAIL SALES, HUMBOLDT AND LANDER COUNTIES

Retail sales	Thousands of dollars, 1975 base										
	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Food	111	272	537	1,028	1,044	812	919	785	327	255	267
Eat and drink	45	110	217	416	423	329	372	317	132	103	108
General merchandise	79	192	379	727	738	575	650	555	231	180	189
Apparel and accessories	33	81	160	305	310	241	273	234	98	76	80
Furniture and household	29	68	136	261	265	206	233	199	83	64	68
Automotive	98	242	476	913	927	721	816	697	290	227	238
Service station	40	98	193	371	377	293	332	283	118	92	96
Lumber and hardware	34	85	167	321	326	254	287	245	103	79	83
Drugs	25	60	117	226	229	178	201	172	71	56	59
Other	48	118	233	446	454	352	399	341	142	110	117
Total	542	1,326	2,615	5,014	5,093	3,961	4,482	3,828	1,595	1,242	1,035

Source: Applicant's Environmental Report.

TABLE 3-18
ESTIMATED PROPERTY TAX REVENUES NORTH VALMY PLANT
(BASED ON 1976-77 TAX RATES)

Year	Total value (000)	Assessed value (000)	80 cent school	70 cent school	31.9 cent school bonds	45.2 cent hospital	91.9 cent county	15 cent fire	25 cent state	Totals ($3.59)
1975	1,813	636	5,080	4,445	2,206	2,870	5,836	952	1,587	22,796
1976	7,283	2,549	20,392	17,843	8,131	11,521	23,425	3,823	6,372	91,507
1977	17,593	6,158	49,264	43,106	19,644	27,834	56,592	9,237	15,395	221,072
1978	54,103	18,936	151,488	132,552	60,406	85,591	174,022	28,404	47,340	679,803
1979	47,090	33,981	271,848	237,867	108,399	153,594	312,285	50,971	84,952	1,219,916
1980	171,800	60,130	481,040	420,910	191,815	271,788	552,595	90,195	150,325	2,158,668
1981	201,500	70,525	564,200	492,675	224,975	318,773	648,125	105,788	176,312	2,531,848
Total			1,543,312	1,350,398	615,396	871,971	1,772,880	289,370	482,283	6,925,610
1982[a/]	8,482	2,969	23,752	20,783	9,471	13,420	27,285	4,453	7,422	106,586

a/ Based on transmission line mile charge.

Source: Humboldt County District Attorney's Office.

agreement has not been made; therefore, the percentage distribution for each county cannot be determined at this time.

Housing Characteristics

Housing will continue to be in short supply during the construction phase of the project. The Applicant's Environmental Report projected peak housing requirements for construction and operation personnel occurring in 1980 and 1981 (see Table 3-19, p. 3-63). The Applicant intends to provide accommodations for 156 workers in the bachelor quarters, and an additional 66 workers would be accommodated in the camper vehicle area.

However, additional housing would be needed for the remaining construction and operation employees and the secondary employees and their familites. The impact could be severe enough that Winnemucca (and particularly Battle Mountain), would have waiting lists for new available housing.

The impact becomes more severe when excess housing and an over-supply of public services develops after the construction phase is complete (1984). The results would be a lowering of property values and an over-extension of public services with a declining property tax base.

Education

It is projected that school enrollment increases resulting from the proposed power plant construction would primarily be within the community of Winnemucca. (Table 3-20, p. 3-64 , depicts school enrollment growth as population increases due to power plant personnel settling into the area.)

TABLE 3-19
ESTIMATED COMMUNITY HOUSING NEEDS, CONSTRUCTION AND OPERATION EMPLOYEES

	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Winnemucca											
Single family	4	11	22	59	75	68	76	79	67	74	80
Mobile home	8	23	47	90	88	60	68	52	16	11	11
Camper vehicle	0	0	0	0	0	0	0	0	0	0	0
Company quarters	0	0	0	0	0	0	0	0	0	0	0
Motel/hotel	5	11	22	38	36	27	32	25	4	0	0
Golconda											
Single family	0	0	0	0	0	0	0	0	0	0	0
Mobile home	3	6	12	21	19	14	17	14	3	0	0
Camper vehicle	0	0	0	0	0	0	0	0	0	0	0
Company quarters	0	0	0	0	0	0	0	0	0	0	0
Motel/hotel	0	0	0	0	0	0	0	0	0	0	0
Valmy											
Single family	0	0	0	0	0	0	0	0	0	0	0
Mobile home	1	2	5	9	7	5	6	4	1	0	0
Camper vehicle	9	20	38	66	63	48	55	44	7	0	0
Company quarters	21	48	90	156	148	114	131	105	17	0	0
Motel/hotel	0	0	0	0	0	0	0	0	0	0	0
Battle Mountain											
Single family	1	4	9	26	35	32	34	35	29	31	32
Mobile home	8	22	45	82	79	55	62	48	13	6	7
Camper vehicle	0	0	0	0	0	0	0	0	0	0	0
Company quarters	0	0	0	0	0	0	0	0	0	0	0
Motel/hotel	3	8	15	25	24	18	21	17	3	0	0

Source: Applicant's Environmental Report.

TABLE 3-20
SCHOOL ENROLLMENT AND PEAK ENROLLMENT
WINNEMUCCA (HUMBOLDT COUNTY)

School	1975	1981	Plus peak	Capacity
Winnemucca Grammar	223	254	320	480
Winnemucca Junior High	349	398	432	490
Lowry High	439	500	543	585

Only Winnemucca Grammar School has a considerable level of flexibility in student population size. Lowry High School and Winnemucca Junior High School would be approaching capacity levels by 1981. Any substantial "boom" development within the region would constrain local educational facilities.

Construction of the proposed power plant would also affect school enrollment increases in Lander County. These increases would affect the community of Battle Mountain. (Table 3-21 depicts school enrollment growth as population increases due to power plant personnel settling into the area.)

TABLE 3-21
SCHOOL ENROLLMENT AND PEAK ENROLLMENT,
BATTLE MOUNTAIN (LANDER COUNTY)

School	1975	1981	Plus peak	Capacity
Eliza Pierce	237	246	292	300
Mary S. Black	176	183	207	220
Battle Mountain High	211	219	249	220

Battle Mountain High School would be overcrowded by 1981, as the number of students exceeds the capacity. Mary S. Black and Eliza Pierce Schools would not be filled to capacity; however, they would be approaching their size limitations, necessitating future concern.

Winnemucca schools would need to hire up to seven additional teachers to accommodate the students attributed to the construction and operation of the proposed power plant (see Table 3-22, p. 3-65). Battle Mountain High School would need up to five additional teachers to

handle the increase in school age children of personnel hired to construct and operate the proposed power plant. These estimates assume that the student-teacher ratios remain constant throughout the construction and operation phase of the proposed project.

TABLE 3-22
ESTIMATED PEAK ADDITIONAL SCHOOL ENROLLMENT

	Winnemucca		Battle Mountain	
	Additional			
Grade	Students	Teachers	Students	Teachers
K - 5	66	3	46	2
6 - 8	34	1.5	24	1
9 - 12	43	2	30	1.5
Total	143	6.5	100	4.5

Source: Applicant's Environmental Report.

Statements made by each superintendent of schools for Humboldt and Lander Counties at Public Service Commission hearings reflect apparent concern for educational facilities in light of the proposed power plant:

> No, we would not be capable of handling the growth for high school students with the present facilities and with the anticipated growth of the Duval Mining operation. However, we are presently seeking to go before the bonding commission for a $2.7 million bond issue for a new high school, converting the present high school into a junior high school. We would then have sufficient room for Duval and Sierra Pacific students. If the bond issue were to fail, it would mean half-day sessions regardless of the additional student population caused by the Sierra Pacific power plant construction. (Frank Langlinais, former Superintendent of Schools, Lander County.)

> If the projections that most students in Humboldt County would live in Winnemucca hold true, we would require virtually no capital outlay to educate the projected increase or the even higher figures which I mentioned that we could accommodate. If more students wind up living in Valmy and Golconda, we would have available room on

> our present buses. However, if there were a very substantial increase in the number of students living in Valmy or Golconda, we might have to think in terms of capital outlay for additional buses or perhaps some portable classrooms. (Robert J. Scott, Superintendent of Schools, Humboldt County.)

Health Services

The temporary nature of the peak demand for the project suggests that the project related increase in health care needs could be handled with the present personnel and existing facilities, at least on a short-term basis. The relatively low occupancy rates (approximately 50 percent) for both Humboldt and Lander County hospitals supports this conclusion. Hospital administrators in Winnemucca and Battle Mountain have expressed concern for the availability of emergency care at the plant site. Adequate water and sewage systems exist to accommodate projected population increases.

Law Enforcement

While cooperation may be expected between agencies, Lander County officers are hesitant to cross the county boundary except in emergency cases. As a result, most law enforcement requirements near the proposed site would have to be handled by the Humboldt County Sheriff's office located approximately 40 miles away in Winnemucca. Any significant increase in population in the Valmy area would necessitate some form of fulltime resident law enforcement. Criminal incidence rates should increase for the less violent crimes of property and drunkenness, and local legal institutions would have additional workloads as a result of the increase in population.

Fire Control

Fire incidence rates may increase for both Winnemucca and Battle Mountain. An increase of population in the Valmy area increases the chances for property damage due to fire. The proposed project site is expected to be self-protecting in case of an on-site fire. However, the housing area adjacent to the project site may be without immediately available protection. (The location is about 25 miles from existing fire equipment.) Under these conditions, structure fires would be more destructive than under usual conditions.

The Bureau of Land Management would have the primary fire fighting responsibility for brush and range fires in the areas surrounding the project site.

Recreational Activities

Without additional public recreational facilities in Winnemucca and Battle Mountain, overcrowding of existing facilities would occur.

Winnemucca's one movie theater could be open seven nights a week, and at least two additional tennis courts would be needed. Participants at the public golf course would have to allocate more time for play and would find greater competition for starting times, particularly on weekends.

Lack of recreational outlets within the community of Battle Mountain would put pressure on Winnemucca to provide recreational opportunities for the project construction and operational work forces and their families who reside in Battle Mountain.

Attitudes and Expectations

In Public Service Commission hearings, representatives of local governmental agencies (Humboldt and Lander Counties) and interested community leaders expressed approval for the location, construction, and operation of the proposed power plant. Their response has been that associated problems resulting from a present lack of facilities within the local communities can be resolved, and would have no appreciable impact on standards of living.

In a Sunday edition (February 27, 1977) of the Nevada State Journal-Reno Evening Gazette an article portraying life in the community of Winnemucca discussed expectations associated with population and economic growth due in part to the proposed North Valmy power plant. The consensus portrayed by community leaders was a desire for orderly growth. The power plant was felt to be a plus for community expansion; however, concern was voiced over "boom-bust" growth. It is apparent that the community is aware of the potential situation.

Valmy is the community closest to the proposed power plant. Since the community is owned and operated by one couple, their concerns and expectations permeate local attitudes. A quote from an article (Nevada Life, Nevada State Journal-Reno Evening Gazette, February 27, 1977) about the owners depicts this attitude:

> We have a perfect entrance here now...we really have all the business we can handle. What happens if our business increases 40 percent? If it gets to be too much I might have to sell out. I just wish I was 25 years younger.

The rapid growth trends in the Reno and Carson City areas in recent years have created skepticism toward growth in general. For example, the population growth in Carson City over the past 10 years has made people aware of the strain excessive growth can place on the infrastructure of a community. There are repeated complaints by local residents that the area is "not the same any more," and some newcomers feel that the quality of life they were seeking is rapidly disappearing. Residents are, therefore, more sensitive to factors which accompany growth, and are quick to criticize any adverse

effects that they might associate with any proposed project. Residents are opposed to overcrowded housing and schools, and are greatly concerned about the quality of air and water.

The smaller (and more rural) communities would, on the other hand, readily accept any temporary impact resulting from the proposed construction in order to promote employment and economic growth. There was evidence throughout each of the associated rural communties that the local officials were interested in promoting their community as an ideal place for newcomers to live. They were more than willing to point out the advantages of their particular area, and were insistent in many cases that a personal tour would prove their community to be the best possible location for a power plant. Although some concern was expressed over the ability of the communities to accommodate a large influx of families during construction, it was overshadowed by the desire to improve the area through expansion and economic growth.

Transmission and Communications Systems

Construction and Maintenance Labor

The impacts of constructing the proposed transmission lines on the social and economic aspects of the ES area would be for the most part temporary, and generally of minor significance. The primary economic activity anticipated would be the short-term introduction of the working force into the local economic profile.

The majority of economic impacts on the ES area related to the proposed construction activity has been identified as beneficial--primarily the purchase of local goods and services. It is anticipated that the bulk of the salary income would not remain in the area due to the fact that the majority of the labor force is expected to be transient. The total working force expected to be located in any one community at a single time should not exceed 30 to 40 workers, and the communities located within the ES area (particularly along the recommended routes) are tourist oriented and fully capable of accommodating a reasonable temporary increase in transient population.

Social impacts created by the construction work force on the structure of the communities within the ES area would be short-term, and are not expected to generate adverse effects. The communities in question have adequate capabilities to provide basic health, police, and other community services for the resident population as well as experiencing the seasonal demands of a much larger tourist population. Because of the transient nature of the working force and the fact that few, if any, of the construction workers would bring school

age children into the area, no impact is expected on local employment and income. However, it is possible some non-skilled labor may be hired locally.

Taxation

The transmission system would be expected to add tax revenues to counties through which the proposed transmission corridors would pass. The tax revenue is dependent on line miles within the county and on the ad valorum rate each county uses. (Table 3-23, p. 3-70 , delineates county revenues expected from the proposed transmission line construction.) An important point to note is that though the power plant would be built in Humboldt County, little of the transmission line construction would be in that county's jurisdiction for assessing.

Housing

The social impacts created by the construction work force on the affected communities would be short-term, and are not expected to generate adverse impacts. Although the size of the construction work force could vary widely (depending on time constraints) the communities located along the various corridor routings are primarily tourist oriented and fully capable of accommodating a temporary increase in transient population. This estimation is based on currently available motel units and through personal contact with service sector personnel in the affected communities. The towns in question have adequate facilities to provide basic health, police, and other community services for the resident population as well as experiencing the seasonal demands of a much larger tourist population. Due to the transient nature of the working force, and the fact that few, if any, of the construction workers would bring school age children into the area, no impact is expected on the local populations.

Due to the highly mobile nature of transmission line construction activities and the low labor requirement, the impact on housing would be negligible in the communities along the proposed route.

Attitudes and Expectations

Previous documents (Tracy-Oreana Environmental Analysis Record and the Oreana-Hunt Final Environmental Statement) have determined little, if any, impact in attitudes or expectations of the local populace toward construction of a transmission system. There is a difference between rural and urban residents' perceptions of power transmission systems and their use. Rural residents perceive transmission lines as a means to acquire necessary electrical energy for home and farm consumption. Urban residents see transmission lines as contributing to population growth, urban sprawl, and environmental deterioration.

TABLE 3-23
ESTIMATED TAX ASSESSMENT AND REVENUES (BY CORRIDOR AND COUNTY)
FOR THE TRANSMISSION SYSTEM

Corridor-County	Line miles	Estimated assessment[b]	Estimated tax revenues[c]
Valmy to Austin			
Lander County:			(3.57)
C + B[a]	82.5	2,062,500	73,631
A + D	88.0	2,200,000	78,540
A + B	78.5	1,962,500	70,061
C + D	92.0	2,300,000	82,110
Humboldt County:			(3.28)
C	19.5	487,500	15,990
A	17.0	425,000	13,940
Valmy to Mira Loma			
Humboldt County:			
H	57.0	1,425,000	46,740
E	20.0	500,000	16,400
Pershing County:			
H + F	92.0	2,300,000	69,690
E + F	99.0	2,475,000	74,992
Churchill County:			(3.75)
F	20.0	500,000	18,750
Washoe County:			(3.67)
G	25.0	625,000	22,950
Storey County:			(3.80)
G	11.0	275,000	10,450

a/ Segments are lettered according to the key on the ES Area Map.

b/ Based on $25,000 per line mile.

c/ Estimated tax revenues are based on Local Government Red Book ad valorem tax rate for fiscal year 1975-76.

Adapted from the Applicant's Environmental Report.

Standard of Living

The rural counties which would be impacted by the proposed transmission line (such as Pershing and Churchill Counties) experience a high level of transfer payments and economic activities primarily related to agriculture and mining interests. Within this environment, the construction of a transmission line would have the following impacts: (1) minimal employment, and (2) expansion of the traditional income-employment base by enhancing the possibilities of both agriculture and mining (through the provision of electrical energy to intensify and expand these sectors).

TABLE 3-24
SUMMARY OF MAJOR IMPACTS BY CORRIDORS AND PLANT SITE

Resource	Valmy to Austin corridor				Valmy to Reno corridor		Power plant complex
	AB	AD	CB	CD	EFC	HFC	
Soils							
High erosion hazard	14 miles	14 miles	14 miles	14 miles	77 miles	58 miles	912 acres total surface disturbance.
Medium erosion hazard	15 miles	28 miles	4 miles	10 miles	19 miles	109 miles	
Low erosion hazard	70 miles	64 miles	83 miles	77 miles	52 miles	37 miles	
Total acres surface disturbance	280	290	277	287	539	517	
Air Quality	Dust production from construction activities and post-construction use of access roads. Ambient air quality standards are already frequently exceeded.	Same as AB	Same as AB	Same as AB	Same as AB	Same as AB	Introduction of gases and particulates into the atmosphere from coal combustion. Disposition of salts from cooling tower drift in the immediate vicinity of the plant. Dust production from construction surface disturbance and plant operations including coal handling and ash disposal.
Water Resources	Increased sediment concentrations (from about 1,000 ppm to 5,000 or 10,000 ppm) could occur in stream crossings during construction.	Same as AB	Same as AB	Same as AB	Same as AB	Same as AB	Consumption of 7,830 acre-feet of water per year per 250 MW unit. Pumping of water for plant use would lower water levels in the Valmy well and in the rest area well near Valmy and may affect some existing nearby irrigation wells. Production rates of these wells would not be affected. Non-quantifiable secondary impacts (reduced water quality and increased groundwater consumption) could occur throughout the Service Area as a result of increased power availability and usage of that power.
	Location of any equipment service site near a water course could result in degradation of water quality during construction if gas, oil, or other wastes were deposited into waters through surface flow or seepage.	Same as AB	Same as AB	Same as AB	Same as AB	Same as AB	
	Any removal of ground cover next to drainages would increase the dissolved solids and sediment concentrations during period of streamflow until revegetation occurs.	Same as AB	Same as AB	Same as AB	Same as AB	Same as AB	
Vegetation							
Salt desert shrub	126 acres	155 acres	150 acres	184 acres	222 acres	296 acres	808 acres salt desert shrub; 14 acres willow/riparian.
Northern desert shrub	117 acres	104 acres	103 acres	80 acres	300 acres	217 acres	
Grass	29 acres	24 acres	12 acres	7 acres	0 acres	4 acres	912 acres total disturbance.
Woodland	12 acres	7 acres	12 acres	7 acres	17 acres	0 acres	
Total acres disturbance	280	290	277	287	539	517	
Wildlife							
Big game habitat	19 miles	10 miles	11 miles	2 miles			
Upland game habitat	25 miles	16 miles	17 miles	8 miles	56 miles	37 miles	14 acres
Sage grouse complexes	3	3	2	2	105 miles	121 miles	14 acres
Land uses	Land use impacts common to all corridors and the plant site include 1) commitment of the land to future utility or industrial uses, and 2) development of agricultural lands.	Same as AB	Same as AB	Same as AB	Same as AB	Same as AB	Same as AB
Cultural resources							
High potential	16 miles	16 miles	16 miles	44 miles	12 miles	32 miles	Destruction of 16 archaeological sites and transfer of eight archaeological sites and one minor historical site from public ownership.
Moderate potential	40 miles		64 miles				

TABLE 3-24 (CON'T.)

Recreation resources	Would lower scenic quality and aesthetic values for dispersed recreation activities near Willow Creek Reservoir, and would introduce the only major man-made facility on the west slope of the Toiyabe Range, a popular trout fishing, hunting, and sightseeing area.	Would lower scenic quality and aesthetic values for dispersed recreation activities near Willow Creek Reservoir. It would introduce the only major man-made facility in Antelope Valley and on the west slope of the Shoshone Range.	Would lower scenic quality and aesthetic values along recreation access routes to rockhound areas at Battle Mountain, at 11 ponular fishing streams, and at hunting and sightseeing areas along the west slopes of the Toiyabe and Shoshone Mountain ranges.	Would lower scenic quality and aesthetic values along access routes to dispersed recreation and rockhound areas at Battle Mountain, and at dispersed hunting and sightseeing areas on the east side of Antelope Valley.	Would lower quality of recreation experience along recreation use areas in the Humboldt Range, Sacramento Canyon, and the East Range. Water related activities at the Humboldt River crossing would be affected by construction.	Would cause physical impacts to a private recreation area on the north end of the Humboldt Range, the Cosgrove roadside rest area, a proposed State Recreation Area, and a proposed roadside rest area on I-80 west of Pye Patch Dam. Construction would affect fishing use at Rock Crossing and dispersed recreation at the north end of the Humboldt Range, the Winnemucca area, and at Sonoma Mountain.	The plant complex would change land uses and reduce availability of public recreation use on 940 acres. Scenic and aesthetic degradation would lower quality of affected area for sightseeing and outdoor recreation experiences.
Social-Economic factors	The impact of constructing the proposed transmission lines on the social and economic aspects of the IS area would be for the most part temporary, and generally of minor significance.	Same as AB	Same as AB	Same as AB	Same as AB	Same as AB	The proposed plant site complex poses social and economic impacts on the communities of Winnemucca and Battle Mountain. Population, employment, government finance and taxation, housing, and recreation would be primarily impacted. The plant site construction and operation personnel and families and secondary employees and families would add a peak of 1,134 additional personnel to the region (including Winnemucca and Battle Mountain) in 1981.
Estimated Tax Revenues per year:							
Lander County	$70,061	$78,540	$73,630	$82,110			
Humboldt County	13,940	13,940	15,990	15,990			
Total	$84,001	$92,480	$89,620	$98,100			
Humboldt County					$ 16,400	$ 46,740	
Pershing County					74,992	69,690	
Churchill County					18,750	18,750	
Washoe County					22,950	22,950	
Storey County					10,450	10,450	
Total					$143,542	$166,580	
Visual resources							
High	24 miles	39 miles	30 miles	45 miles	53 miles	73 miles	The proposed power plant would be a prominent industrial intrusion into a basically rural landscape. The 500-foot stacks would constitute a significant contrast to the existing landscape character and the strobe lighting would attract attention to the complex. Surface disturbance and removal of vegetation for construction would alter the landscape character. The complex would be visible to an estimated 7,600 people per day traveling on I-80.
Medium	52 miles	30 miles	62 miles	30 miles	12 miles	56 miles	
Low	21 miles	37 miles	9 miles	25 miles	116 miles	75 miles	

MITIGATING MEASURES

4

MITIGATING MEASURES

INTRODUCTION

If the proposed project is approved, Federal, State, and local government agencies having jurisdiction in the impact area would issue rights-of-way, transfers of title, and other required permits and/or grants to allow implementation of those portions of the proposed action crossing lands under their respective administration. The impact area includes the project site, the rights-of-way from Valmy to Austin and Valmy to Mira Loma via the selected corridors and, for social-economic factors, the Sierra Pacific Power Company's Service Area (including portions of California). Some construction such as staging areas, storage yards, and portions of access roads may extend beyond the corridor limits. (See the ES Area Map and Service Area Map, pp. 1-11 and 1-2 .)

Involved governmental agencies are obligated under statutes, regulations, and specific contractural requirements to specify stipulations intended to mitigate environmental impacts. These stipulations specify particular physical actions required of the applicants and contractors for compliance.

If a decision is made to construct the proposed power plant and transmission lines, many of the identified potential impacts would be mitigated by means of the following general measures:

(a) Specific measures to protect the environment [both public (Bureau of Land Management) and private lands] in regard to the design, construction, and maintenance of the plant facilities, transmission lines, and ancillary facilities will be incorporated as stipulations in Bureau of Land Management (BLM) grants of rights-of-way and temporary use permits. The Authorized Officer and/or his designated area representative will be responsible for monitoring construction of the line to insure compliance with these stipulations.

The Authorized Officer will be the District Manager of the respective District in which construction activity is taking place. The Authorized Officer will appoint a Compliance Officer for his respective District, and will delegate to the Com-

pliance Officer full authority to interpret and enforce stipulations included in the land use grants. This delegation will be clearly communicated to the applicant at a pre-construction meeting.

The Authorized Officer may, at any time, inspect the on-site construction and maintenance activities of the Applicant in connection with the project. Official representatives of State agencies or other Federal agencies may also inspect such activities if necessary to the performance of official duties relating to the project to insure compliance with the laws and regulations under their respective jurisdictions.

For purposes of information and review, the Authorized Officer may call upon the Applicant at any time to furnish any or all data related to pre-construction, construction, maintenance, and rehabilitation activites undertaken in connection with the proposed project.

If a situation should arise where the Complaince Officer feels that the terms of the land use grants are being violated and immediate action is necessary, he has the authority to suspend construction activity until adequate corrective measures are taken. Each Compliance Officer will keep his District Manager informed concerning the progress of the project and any problems which may arise. (BLM Instruction Memorandum No. NSO 76-171, July 15, 1976.)

(b) Pre-construction conferences will be held with representatives of Sierra Pacific Power Company, their specific contractors, the BLM, and other jurisdictional agencies. These sessions will serve to identify environmentally sensitive areas, and to explain the procedures and stipulations required to protect the environment. In addition, review of two documents, Environmental Guidelines (Environmental Committee of the Western Systems Coordinating Council, 1971), and Environmental Criteria for Electric Transmission Systems (U. S. Department of the Interior, U. S. Department of Agriculture, 1970), will be undertaken by the concerned parties to insure complete understanding and compliance therewith by Sierra Pacific Power Company and its respective contractors.

The Applicant will be required to designate a representative for field operations who will be the sole field contact of the Applicant and its contractors in all dealings with the Authorized Officer; said representative will be empowered on behalf of the Applicant and its contractors, subcontractors, and agents to communicate with the Authorized Officer and to receive and comply with all communications and decisions of the Authorized Officer.

The Applicant will inform all its employees, agents, contractors, and subcontractors (and their respective employees) of the provisions of the Wild Horse and Burro Act of 1971, the Bald Eagle Protection Act of 1940, as amended, and the Antiquities Act (16 USC 431-433).

Mitigating measures are presented under the following headings:

1. Measures required by Federal agencies.
2. Measures required by State, county, and local agencies.
3. Applicant-committed measures.

MEASURES REQUIRED BY FEDERAL AGENCIES

Bureau of Land Management (BLM)

The BLM will require the Applicant to comply with the following measures intended to mitigate potential impacts to the environment.

Soils, Watershed, and Water Quality

Before any construction begins, the Applicant will present a complete plan of operation to the Authorized Officer. (For the purposes of this discussion, Authorized Officer also refers to his designated Compliance Officer.) The Applicant shall agree to stipulations as to the location of tower sites, roads, and related facilities, and to the construction and rehabilitation methods required to meet the conditions of the permits and/or grants. The Applicant must contact the respective District Manager and other responsible officials for a pre-construction conference to arrive at a mutual and complete understanding of the job, the surface protection measures to be taken, the inspections required, and the liaison and requirements pertinent to the project site and transmission line construction. The proposed mitigation measures for the protection of soils and watershed deteriorated as a result of construction (as listed below) will be supervised by the Authorized Officer, who will monitor specific site activities in instances where judgment is required for possible modification of stipulations.

BLM will require the Applicant to undertake every reasonable means to minimize erosion and soil damage in connection with any construction, rehabilitation, or maintenance operations including (but not limited to) construction of water bars, cross ditches, or other structures in accordance with the specifications of the Authorized Officer. Erosion control facilities will be constructed to avoid induced and/or accelerated erosion and to lessen the possibility of forming new drainage channels resulting from project activities. Under no circumstances will scalping of topsoil be permitted outside of the project site area or transmission line rights-of-way.

New access road construction required for the construction and maintenance of the transmission lines will be built to pertinent standards as set forth in BLM Manual 9113; water bars and drainage structures will be constructed as deemed necessary by the Authorized Officer. Specifications will take into account the equipment

which would be used, particularly the heavy construction and line-tensioning vehicles. To the extent possible, new roads required for construction will be routed through areas where excavation and fills are unnecessary or minimal in extent, to achieve grades which will allow passage of the required construction vehicles. These measures will partially mitigate impacts to soils and the visual resource. Water bars will conform to the specifications of the following table.

Slope Percent	Spacing of Water Bars
1% or less	400 feet
1% to 5%	300 feet
5% to 15%	200 feet
15% to 25%	100 feet
Greater than 25%	50 feet or less

BLM will require, at the discretion of the Authorized Officer, dust control measures (watering or graveling) on roads within one mile of residences or other populated areas. Watering of roads will also be required prior to, and during, periods of heavy vehicular traffic in areas of fine-textured soils and in areas where the soil surface is disturbed below a depth of six inches. This will partially mitigate fugitive dust problems and problems of general soil disturbance.

BLM roads required for access by the Applicant will be upgraded, maintained, and/or rehabilitated as necessary to prevent damage to these roads, such measures to be determined by the Authorized Officer.

Upon completion of construction activities, areas no longer used for temporary access roads, campsites, equipment storage, and other such uses will be restored by the Applicant to their natural state (insofar as is practicable) as soon as possible in accordance with a rehabilitation plan approved by the Authorized Officer. The Applicant's rehabilitation plan must be approved in writing by the Authorized Officer prior to termination of use of any such area or any part thereof.

All temporary facilities will be "put-to-bed" by the Applicant upon completion of their use unless otherwise directed by the Authorized Officer. Put-to-bed is used herein to mean that access roads, material storage and/or assembly sites, and other areas used during construction activities will be left in such stabilized condition that erosion will be minimized through the use of adequately designed and constructed water bars and revegetation; that culverts and bridges shall be removed by the Applicant in a manner satisfactory to the Authorized Officer, and that such roads, sites, and areas will be closed to use if necessary.

The Applicant will immediately discontinue any construction or other operations upon receipt of written notice from the Authorized Officer that, due to weather or soil moisture conditions, such activities will cause excessive damage to the soil. The Authorized Officer will notify the Applicant in writing when such operations may be resumed. The Applicant will immediately discontinue use of government roads upon receiving written notice that the Authorized Officer has determined continued use during construction activities will cause excessive damage to said roads.

The Applicant will be required to comply with all applicable State and Federal laws and regulations pertaining to water quality in connection with the activities associated with the proposed action. All operations will be conducted in such a manner as will avoid:

(a) Blockage of any drainage system;
(b) Changing the character, or causing the pollution or siltation of rivers, streams, reservoirs, ponds, water holes, or springs;
(c) Damaging fish and wildlife resources and habitat.

Cuts and fills causing any of the above mentioned problems will be repaired immediately in accordance with the specifications of the Authorized Officer.

All used chemicals, waste oil, and other petroleum products will be removed to an approved sanitary landfill. Under no circumstances will any of the above materials be disposed of into any drainage, river, intermittent watercourse, reservoir, or onto the soil. BLM will require the Applicant to utilize portable chemical toilets during construction activities.

BLM will require culverts (or other environmentally protective measures, at the discretion of the Authorized Officer) to be installed as needed at all live stream crossings along the access routes in order to reduce impacts to streams and the aquatic habitat. Upon termination of use, these items will be removed by the Applicant. Additionally, no dry or intermittent drainage channels will be blocked with debris, and no soil along roads and trails will be pushed into streambeds.

Where practicable, surface materials taken from disturbed areas will be stockpiled and utilized during post-construction rehabilitation unless otherwise approved in writing by the Authorized Officer. Stabilization practices, as determined by the needs for specific sites, will include, but will not be limited to, seeding, planting, mulching, and placement of mat binders, soil binders, rock or gravel blankets, or other structures as specified by the Authorized Officer.

The Applicant will be required to dispose of all waste construction materials and related litter (including vegetative cover accumulated through land clearing) within 90 days after conclusion of construction operations. The manner of disposal will be in accordance with the instructions of the Authorized Officer.

Vegetation

Hand clearing of vegetation will be used in areas where the Authorized Officer determines use of heavy equipment would be detrimental to existing conditions.

In areas of natural grass and low brush cover, need for roads or bladed trails is usually minimal, with the exception of areas of steep terrain. In these locations the natural ground cover will not be removed. Brush blades or back-blade techniques will be used in these areas, if necessary. Where practicable, cleared plant material will be chipped or shredded for use as mulch during the rehabilitation process.

Reseeding will be carried out in areas identified by the Authorized Officer as soon as practicable after conclusion of construction activities. The Applicant will provide for prompt scarification and seeding of disturbed areas which, in the opinion of the Authorized Officer, lend themselves to successful seeding. (Any scarification on soil surfaces following soil compaction is beneficial, if only for surface runoff control.) The seed mix (agreed upon by BLM) will be provided and applied by the Applicant in accordance with specific instructions and techniques prescribed by the Authorized Officer.

The Applicant will apply grass seed, fertilizer, and mulch uniformly on the designated areas as specified by the Authorized Officer. No seed, fertilizer, or mulch will be applied when wind velocities will prevent uniform application of the material on the designated areas. Mulch will be utilized where necessary as specified by the Authorized Officer and will consist of straw, hay, or specially prepared wood cellulose fiber processed in such a manner that it contains no growth or germination-inhibiting factors and will be free of noxious weed seed.

After completion of the first growing season, BLM will require an inspection and evaluation of seeding measures taken, with further evaluation during the following two growing seasons. This evaluation will be made by the Authorized Officer. If rehabilitation fails to establish in three years because of inadequate reseeding techniques or drought conditions, the Applicant would be required to reseed the previously treated area. The revegetation process would partially mitigate impacts to vegetation, soils, and to the visual resource.

After the required lands actions have been completed, areas of disturbance anticipated to occur where threatened or endangered flora have been reported, or in similar habitats near reported locations, must be inspected by a qualified field botanist. This selected individual must be satisfactory to both the Applicant and BLM. Areas where threatened or endangered flora occur will be avoided by all construction activity. This includes access roads, overland travel, equipment storage areas, tower sites, staging areas, etc.

Wildlife

All hawks, owls, and eagles are protected by Federal law; harassment, disturbance, or killing of these species is prohibited. Therefore, BLM will require the Applicant to have a field inventory of raptor nesting sites performed by a qualified raptor specialist (provided by the Applicant and acceptable to the BLM) if construction activities will be occurring during the sensitive nesting-brood period (March through May). This survey will determine if raptor nesting sites which may be affected by construction activities are actually in use. If a nesting site is in use, construction activities will be confined to the nonsensitive period for raptors.

The BLM will require the Applicant to confine construction activities to nonsensitive periods within all critical wildlife habitats. Sensitive periods are generally defined as follows:

(a) Big game winter habitat - December to April.
(b) Sage grouse strutting-nesting complexes - March through June within critical habitat areas. (See the Wildlife Sections of Chapters 2 and 3, p. 2-37 and 3-33 .)

The Applicant's activities in connection with the proposed project in key fish and wildlife habitat areas may be restricted by the Authorized Officer during periods of fish and wildlife breeding, nesting, spawning, lambing, or calving activity, and during major migrations of fish and wildlife. The Authorized Officer will give the Applicant written notice of such restrictive action. From time to time the Authorized Officer will give the Applicant a list of areas where such restrictive action may be required, together with the anticipated dates of restriction.

Where access is currently limited, the Applicant may be required to close ("put-to-bed") new construction access roads and to restore the area as close as possible to original conditions upon completion of construction activities in order to reduce potential human interference with wildlife and to restore wildlife food, nesting, and protective cover.

The Applicant will take such measures as are necessary to assure unrestricted passage and movement of fish and wildlife. No artificial structure or stream channel alteration that would cause a permanent blockage to the movement of fish will be constructed. The Applicant will comply with any special requirements made by the Authorized Officer for a stream system in order to protect fish spawning beds. The Applicant will repair all damage to fish spawning beds caused by construction, operation, maintenance, or termination of the project components under this grant.

BLM will require that the aquatic and stream habitat be spanned by the transmission lines, avoiding intrusion into the riparian zones by men and equipment and providing a 300 foot minimum buffer strip of undisturbed land, unless otherwise approved by the Authorized Officer. Impacts to nesting waterfowl can be mitigated by deferring construction activities in waterfowl nesting areas from April through June. Measures already listed under soils, watershed, and water quality will also mitigate impacts to the aquatic habitat.

Visual and Recreational Resources

The Applicant will provide for the protection and enhancement of aesthetic values in the planning, construction, maintenance, and rehabilitation phases of the project and any additional reasonable measures deemed necessary by the Authorized Officer to protect the aesthetic values in areas of critical environmental concern.

The mitigating measures proposed for the visual resource are also considered the best method for lessening the impacts to the recreation experience. Those specific recreation resources affected by physical and activity impacts of the transmission line construction will be used as "observation sites" for the performance of the on-site visual contrast rating prior to commencing construction activities; however, observation sites will not be limited to only these recreation-oriented areas.

BLM will require a specific on-site application of the visual resource contrast rating procedure in all areas classified as having high visual impact prior to final design, tower location, road location, storage and staging area designation, etc., so that proper adjustments can be made in order to reduce the visual impacts of the transmission lines and ancillary facilities. (The contrast rating will determine the specific sites in which these measures will apply. Refer to Chapter 3, p. 3-50 for physical and activity impacts, and to Appendix F, p. 10-35 for an explanation of the visual contrast rating system.) Specific mitigation measures applicable to the visual and recreational experience are:

(a) Location of individual towers in critical viewsheds in a manner which avoids skylining towers.

(b) Crossing of roads and trails in sensitive visual areas in a manner designed to lessen impacts to the visual resource.

(c) Reducing reflectivity of the towers and microwave facilities.

Cultural Resources

Archaeological and historic resources in the plant site area have been thoroughly identified, in compliance with Executive Order 11593 and 36 CFR 800.4a. The cultural resources are potentially eligible for inclusion on the National Register of Historic Places only on the basis of scientific information which they may yield. In-situ preservation is the most desirable means of protecting this information. On sites for which in-situ preservation cannot be guaranteed, adverse impacts will be mitigated through recovery of the scientific information, as outlined by Rusco (1976) and Seelinger (1977). These steps have already been taken for three of the sites, all located on privately owned land (Davis, Fowler, and Rusco, 1976). Alternatively, nine sites which would not be destroyed could be retained in public ownership.

Cultural resources along transmission line corridors have not yet been identified. In selection of corridors and final placement of the transmission lines within the corridors, a serious effort will be made to avoid areas with strong potential for cultural resources. That portion near the Austin Historic District is of particular concern, since the presence of the towers may result in additional visual intrusions. Skillful placement of towers in relation to land forms may mitigate much of this impact, and use of wooden poles for portions visible from the Austin Historic District will further minimize the visual intrusion. Several existing transmission lines (using wooden poles, which are visible but not highly conspicuous) terminate at the Austin substation. It is anticipated that with proper mitigating measures, no adverse affect on the Austin Historic District will result. It is anticipated that other sites along the corridors and at communications facilities will warrant protection solely on the basis of their information potential. These resources will be thoroughly inventoried, as required by Executive Order 11593 and 36 CFR 800.4a. Wherever possible, the sites should be avoided through strategic tower placement and access location. In situations where this is not possible, the threatened values will be salvaged through collection, excavation, photo documentation, and/or other appropriate measures as determined by the Authorized Officer, and the results fully reported. Coordination with the State Historic Preservation Officer will be maintained throughout this phase of the project, as required by 36 CFR 800.

On the basis of the above, BLM will require the Applicant to engage the services of a qualified cultural resources professional (professionally acceptable archaeologists and/or historians) to complete intensive field surveys (BLM class III) for any unsurveyed portions of the right-of-way (regardless of land ownership), which by definition will include associated areas proposed for significant surface disturbance. Such surveys must be completed, documented by the submission of a report to the Authorized Officer, and specific mitigating measures approved by the Authorized Officer prior to any construction activities. The implementation of this policy will not only protect cultural properties from the primary impacts of actual construction but should mitigate the indirect impact of unsanctioned collecting activities that could possibly result from increased accessibility to the area(s). This would reduce the chances of discovery of unprotected cultural properties.

The BLM will require the Applicant to engage the services of a qualified cultural resources professional to undertake salvage of cultural properties subject to loss or substantial alteration. When such salvage is indicated, it will only be completed under a scientifically sound research design agreed to by the Applicant, the cultural resources professional, and the BLM (Authorized Officer). The respective State Historic Preservation Officer and/or the Advisory Council on Historic Preservation will also be consulted as required.

Salvage will only be stipulated when it has been determined that it is the most reasonable and prudent course of action. A final analytical report on the salvage operations, completed by the cultural resources professional, will be submitted to the Authorized Officer for review and acceptance. Actual construction can proceed before BLM receipt of the final report but not before the Authorized Officer has determined that stipulated cultural resources recovery (salvage) work has been completed in the field, and additionally determined that there is reason to believe that a final report will be submitted within a reasonable amount of time.

The Applicant will immediately bring to the attention of the Authorized Officer any and all antiquities or other objects of historic or scientific interest, including, but not limited to, historic or prehistoric ruins, fossils, or artifacts discovered as a result of operations under this grant, and will leave such discoveries intact. Failure to comply with any of the terms and conditions imposed by the Authorized Officer with regard to the preservation of antiquities may constitute a violation of the Antiquities Act (16 USC 431-433).

Should any previously undiscovered cultural resources be located during actual construction activities, the Authorized Officer

will have the authority to temporarily suspend construction activities until adequate evaluation and mitigating measures have been implemented.

Land Uses

BLM will require the Applicant to locate right-of-way corridors in a manner which will cause the absolute minimum interference with agricultural production. Construction of the transmission line in agricultural areas outside of the crop-growing period will mitigate potential damage to the crops.

BLM will require, where physically practicable, that the transmission line from Valmy to Tracy share a common boundary with the 345 kv intertie #2 approved under a previous grant.

Hazards

The Applicant will conduct all operations in compliance with the applicable provisions of Federal, State, and local laws, codes, and regulations.

The Applicant will take all measures necessary to protect the health and safety of all persons affected by their activities performed in connection with the construction, operation, maintenance, or termination of the project, and will immediately abate any health or safety hazards. The Applicant will immediately notify the Authorized Officer of all serious accidents which occur in connection with such activities.

The Applicant will perform all operations in a safe manner so as to ensure the safety and integrity of the proposed project and will at all times employ and maintain personnel and equipment sufficient for this purpose. The Applicant will immediately notify the Authorized Officer of any condition, problem, malfunction, or other occurrence which threatens the integrity of the project in any way.

All vehicles will be operated at a reasonable rate of speed and due care will be taken to safeguard livestock, wildlife, and personnel in the vicinity of operations. Existing roads and trails will be used wherever possible. If new roads and trails are to be constructed, the Authorized Officer must approve in writing the location and specifications of construction.

The BLM will require the Applicant to permit free and unrestricted public access to and upon the right-of-way for all lawful and proper purposes, except in areas which have temporarily been designated as restricted by the Applicant (with the consent of the

Authorized Officer) in order to protect the public safety and facilities during construction on the right-of-way. The Applicant may temporarily regulate or prohibit public access and vehicular traffic on access roads (with the approval of the Authorized Officer) to facilitate operations and/or to protect the public, wildlife, and livestock from potentially hazardous situations during project operations. The Applicant will provide appropriate warning signs or signals, flagmen, barricades, and other safety measures when regulating or prohibiting public access to or upon access roads.

BLM will require that phase lines crossing the Truckee and Humboldt Rivers or located in proximity to small airports be properly marked so they can be easily avoided by aircraft, even though the height of the towers and lines may not exceed the 200-foot Federal Aviation Administration requirements.

Federal Aviation Administration (FAA)

The FAA will require the Applicant to file a Notice of Construction Alteration, FAA Form 7460-1, pursuant to FAA 77.13 (a) (1) before construction of the 500-foot stacks at the North Valmy Station. Because of their height, obstruction marking and high-intensity strobe lighting will be required. The FAA will determine how obstruction marking and lighting should be applied.

The FAA will require the Applicant to conform to requirements as listed in AC70/7460-2F regarding the maximum height above ground and water level (200 feet) that a transmission line tower can be without filing a Notice of Construction with the FAA.

National Park Service (NPS)

The Park Service maintains the National Register of Historic Places. The Applicant will be required to comply with all measures outlined by the National Park Service in regard to sites which are, or may be, eligible for inclusion on the National Register of Historic Places.

Wilderness

Impacts to potential Wilderness Study Areas as described in Chapter 3 would result from visual (not physical) impacts of the transmission line facilities. The degree of impact on any wilder-

ness resource would depend on the degree of visual contrast between the proposal and the existing landscape. (See Chapter 3, Visual Resources.) Therefore, mitigation techniques described in the Visual Resource section of this chapter would be applied to reduce visual contrasts to such a point as would be considered "substantially unnoticeable" in accordance with Section 2(c) of the 1964 Wilderness Act.

General Measures

The impacts of population growth within Washoe County (a secondary impact of increased power availability) can be mitigated to a certain extent by a controlled growth policy (for example: zone density maximums) as outlined in the Conservation and Population Plan for Washoe County. This plan has been presented (but not yet adopted as the official plan) by the Regional Planning Commission for Reno, Sparks, and Washoe County.

Nevada State Highway Department

The Highway Department will require the Applicant to obtain a permit for crossing State highways with a transmission line. This permit will contain stipulations which the Applicant must comply with in order to mitigate the possible impacts of a transmission line crossing highways. (Refer to Table 3-11, p. 3-44 .)

Nevada Department of Conservation and Natural Resources, Division of Environmental Protection Services

On November 4, 1976, the Applicant was issued Registration Certificate #170, covering "Phase 1 construction" of the proposed project, subject to mitigating measures as attached to the certificate. For brevity, only those measures not previously covered under other sections of this chapter are included here.

The Phase 1 construction of the access road and disposal site will be confined to the area shown on the drawing titled "North Valmy Site Proposed Land Acquisition, Sierra Pacific Power Company," number 12453-PY-SK-1B-3. If any deviation is required from the aforementioned drawing, this office [Division of Environmental Protection Services] must be notified.

Any explosives will be used in small multiple charges to minimize noise, dust, and tremors.

On August 25, 1977, the Applicant was issued registration certificate #195-200 inclusive by the Department of Conservation and Natural Resources (DCNR), covering the following elements of the proposed action: Units #1 and #2, the auxiliary boiler, the coal handling system, the ash handing system, and site disturbance.

Each certificate specifies mitigating measures for each element of the proposed action; those of primary importance which have not already been covered in other sections of this chapter are listed below.

Units #1 and #2

Each unit will be equipped with a continuous monitoring system for opacity, sulfur dioxide, oxides of nitrogen, and either oxygen or carbon dioxide as specified in the Nevada Air Quality Regulations (NAQR).

Data gathered will be submitted as specified in Article 2 of the NAQR and 40 CFR 60.45. Each unit will be emission tested for all pollutants which have an applicable standard by methods of procedures specified in NAQR, once per year for the duration of the operating permit.

Auxiliary Boiler

An analysis of the sulfur content and heat content (per unit weight of fuel oil) will be made prior to operation of the boiler and each year thereafter and a report submitted to the Director, DCNR.

Coal Handling System

The coal handling system will have dust control devices as specified by the registration certificate, and all systems shall be tested and evaluated after installation to insure no violations of applicable NAQR standards occur. Sources of emissions other than those identified in the registration certificate will be controlled to insure compliance with the NAQR.

Ash Handling System

All control devices as listed in the registration certificate will be tested and evaluated after installation to insure that no violation of the NAQR occurs. Sources of emissions other than those specified in the registration certificate will be controlled.

Site Disturbance

The coal reserve storage area will be protected from oxidation and erosion by compaction of the coal. Additional fugitive dust control will be required by the Director, DCNR, if the above method proves inadequate.

Any potential source of fugitive emissions identified by the Director, DCNR, will be controlled to prevent violations of the NAQR.

The Applicant will be required to continuously monitor and record sulfur dioxide concentrations in the ambient air in areas specified in the registration certificate for six months prior to initial boiler start-up and for the duration of the operation permit. Measuring devices will be approved monitor types and all collected data will be submitted to the Director, DCNR.

The Applicant will be required to continuously monitor and record wind speed and direction and ambient temperature at the plant site and at other sites specified in the registration certificate. All data will be submitted to the Director, DCNR, as specified:

> If, within the time period from the beginning of construction to one (1) year after substantial completion of the project, remeasured ambient air concentrations which are attributed to the project for any construction-related or operational-related pollutants exceed ninety percent (90%) of the NAQR development shall cease and/or modification must be made to the project to assure the attainment and maintenance of all applicable ambient air quality standards. (Registration Certificate letter of August 25, 1977, Dick Serdoz to John Saibini.)

APPLICANT- COMMITTED MEASURES

The measures listed in this section have been taken from the Applicant's Environmental Report, Section 14, pp. 14-1 through 14-16. In reference to these measures, the Applicant has stated:

> Mitigating measures include legal and institutional regulations and codes, as well as guidelines for constructing and operating the power plant and transmission lines in a way to enhance safety, reliability, and economy while restricting adverse environmental effects. Sierra recognizes its responsibilities to society and is firmly committed to the guidelines listed in this section as well as applicable legal and institutional regulations and codes. (Westinghouse Environmental Report, p. 14-1.)

BLM considers the measures discussed in the above-mentioned section of the Applicant's analysis to be necessary mitigating measures and that the applicant and contractors will adhere to the provisions of the measures (as listed below). Some overlap of measures listed here as "applicant-committed" and measures mentioned in the preceding section has intentionally occurred. The overlap is used to avoid, where possible, conflicts of wording or definition between the various measures employed to mitigate impacts to the environment, and to clarify, as much as possible, exactly what is considered to be a mitigating action. (Most of the measures listed below are direct quotes; a few have been edited for clarity.)

Measures will be taken to mitigate adverse social and economic effects that might occur as a result of project construction. [No specific measures were identified by the applicant.]

Runoff will be diverted upstream of significantly eroding areas. Additional erosion control measures will include regularly leveling rutted areas and maintaining existing gradients whenever possible.

Construction debris will be promptly and properly removed and disposed [of] in an on-site land-fill.

On-site [construction] materials will be used as much as possible. Borrow areas will be restored when possible.

Care will be taken to prevent the introduction into surface or groundwater systems of chemicals such as soaps, detergents, paints, cleaning fluids, concrete admixtures, gasoline, petroleum, and diesel fuel.

A sulfur dioxide (SO_2) monitoring network will be designed after consultation with the State of Nevada to [insure] that the applicable Nevada ambient SO_2 air quality standards and the significant deterioration class II increments are met while the plant is operating. The...meteorological tower now in use gathering... baseline data will be operated along with the SO_2 monitoring network.

Construction equipment and motor vehicles will comply with existing regulations related to noise [abatement] and gaseous emissions.

Sierra will comply with BLM regulations [contained] in "Rights-of-way, Power Transmission Lines" (43 CFR 2850), and the criteria and guidelines in the Department of Interior-Department of Agriculture document Environmental Criteria for Electric Transmission Systems, Federal Power Commission guidelines Electric Power Transmission and the Environment, and the Forest Service Landscape Management Handbook.

Applicable requirements of the National Electric Safety Code will be met, and the minimum requirements in the American Society of Civil Engineers "Guide for Design of Steel Transmission Towers" will be met or exceeded in tower design.

The final position of the transmission line within the corridor limits will be adjusted...to avoid land use conflicts as much as possible. Self-supporting towers shall be used in areas where a simple adjustment in position will not solve a particular land use [conflict].

Operations shall be conducted so as not to close or obstruct any portion of any railroad, road, or other property until permits have been obtained from the governmental or other authorities having jurisdiction. Until proper authorization has been obtained, no work shall be done that would affect any pipeline, telephone, telegraphic or electrical transmission line, irrigation ditch or other structure, nor shall the rights-of-way or lands appurtenant thereto be entered upon.

Any phase of this operation will be temporarily halted for muddy ground conditions which would unnecessarily disturb the site. All operations will be required to cease during heavy rains.

Travel, including movement of equipment between tower sites and driving on the centerline, will be permitted only on designated system or construction roads. No off-road travel will be allowed. Unauthorized cross-country travel and creation of roads beyond those approved shall be strictly prohibited. The limits of where construction equipment can and cannot go will be clearly

marked at each new site before equipment is brought in. Construction foremen and personnel shall be well versed in recognizing these markers and shall understand the restrictions of equipment movement that is involved.

Full compliance with fire laws and regulations shall be achieved, and any fire plan submitted by any land management agency (with) jurisdiction over lands being crossed by this project shall be followed.

All used oil or other petroleum products shall be hauled away. There shall be no release of crankcase oil, etc., into streams or the soil anywhere. Sanitary wastes shall not be discharged into streams or any streambeds.

A reclamation plan for the ash disposal areas was submitted as a part of Sierra Pacific's application to the Nevada Division of Environmental Protection Services for registration certificates. Reclamation is an annual process that will be applied to the six to eight acres of ash covered since the previous year's reclamation effort. The following steps will be used in revegetation:

(a) In areas where the top six to twelve inches of soil is of significantly higher quality (texture, salinity, organic matter) than deeper soils, this material will be removed separately, prior to ash disposal, and segregated. Such topsoil will not be used in the periodic covering of ash, but will be reapplied over the covered ash areas as part of the annual reclamation process. In areas where no such distinction and separation is justified, then reclamation will proceed on the covered ash. The ash will have been covered by about three foot of soil material and contoured to blend into the landscape as part of the ash disposal process.

(b) Surface preparation will consist of loosening and scarifying with a disc along contour lines. Additional efforts such as a small dozer or sporadic use of a plow may be employed to roughen the surface as needed to prevent runoff and increase moisture holding efficiency.

(c) Fertilizer will be added as necessary to make nutrient levels comparable to original conditions.

(d) Drill and/or broadcast seeding methods will be used. Broadcast seedings will be followed by mulching with straw and will be used where additional surface manipulation (dozers, plows, etc.) is necessary to limit precipitation runoff. Use of a drill on smoother areas will be based upon equipment availability. Any broadcast seeding on smoother areas will be followed by a harrow or dragchain prior to mulching to help cover the seed.

(e) Because of quicker development and more general cover, grasses constitute the principal component of the seed mix with a limited amount of shrubs. Species such as alkali sacaton, Indian ricegrass, various wheatgrasses, and saltbush will be used.

(f) Because of highest precipitation levels occurring in December through May while July, August, and September are the driest months, the seed mix will emphasize species capable of utilizing early spring moisture. Also, reclamation efforts, including seeding, will occur in September each year. If sufficient vegetation cover is not established by this plan, then the time of reclamation and seeding will be shifted to May or June, and irrigation will be applied the first season.

UNAVOIDABLE ADVERSE IMPACTS

5

UNAVOIDABLE ADVERSE IMPACTS

The following sections summarize the unmitigated adverse impacts which would remain if the proposed action were implemented and the mitigating measures delineated in Chapter 4 were applied. In this chapter, the relative values of the unmitigated impacts (and the significance placed on them) are discussed. As in the preceding analysis, the worst case situation is considered.

SOILS

Approximately 912 acres of soil in the plant site area and a maximum of 795 to 874 acres of soil along the corridors (depending upon the corridor selected) would be permanently impacted by the proposed construction. These impacts include surface soil disturbance in all construction areas, subsoil disturbance in areas requiring access road cuts and fills, and disturbance of the entire soil profile down to and including the substrata at the plant site and at transmission tower locations.

Sheet and rill erosion would result on slopes greater than eight percent from any soil disturbance due to soil compaction, which would reduce infiltration rates. Organic matter displacement would allow for raindrop splash effects and subsequent overland flow and erosion.

Soil profiles which have developed congruently with the natural vegetation would be interrupted for several decades or more.

Under normal conditions, natural soil losses average two to four tons per acre per year. Activities associated with construction of plant facilities and transmission lines can create bare ground conditions resulting in averages of up to 30 tons of soil loss per acre per year. This rate would gradually decline in areas where revegetation later occurs. Wind erosion rates of as much as 50 tons per acre per year would be possible in these bare ground areas, depending upon soil properties, slope, and wind velocities. These erosion rates are more significant at elevations below 5,000 feet because of the marginal vegetation-producing climate at those elevations which makes revegetation difficult or impossible.

AIR QUALITY

The impacts to existing air quality have been discussed in Chapter 3. As there are no applicable mitigating measures to reduce these impacts, the net (unavoidable) impacts to air quality remain the same.

In summary, plant operation would generate and introduce into the atmosphere quantities of pollutants including sulfur dioxide (246 g/s), combustion particulates (4.72 g/s), cooling tower drift (6.5 gpm), and unquantifiable emissions such as coal dust and vehicle exhaust. More detailed descriptions of these emission amounts are contained in the Air Quality Section of Chapter 3.

Indirectly, the plant would cause an increase in population both during construction and operation which in turn would lead to increased generation of air pollutants from normal day-to-day human activities (including use of fuels for heating and transportation).

In the event that any of the emission or dust control systems fail to operate as predicted or suffer a mechanical failure, short-term increases in air pollutants would occur. For two units at 100 percent load, a total failure of the baghouse would permit uncontrolled particulate emissions at a rate of 15.6 tons/hour. These systems would be operated under permits issued by the State of Nevada and, should they fail to meet stated performance standards, the operation of the plant could be ordered stopped pending satisfactory correction of the problem.

WATER RESOURCES

Most adverse impacts on water resources resulting from construction activities can be mitigated by the measures discussed in Chapter 4.

Consumption of groundwater at the rate of 3,830 acre-feet per year for each 250-Mw unit is an unavoidable adverse impact resulting from plant operation. The water level would be lowered over the years in some existing wells near the proposed well fields that would supply the plant. The wells that would be affected include: the private well supplying the community of Valmy, the I-80 rest area well across from Valmy, and some irrigation wells. The degree of water level reduction would depend on the exact placement of the new wells. These lowered water levels would not affect the rate of production from these wells since their static water levels (groundwater levels under conditions of no pumping) are considerably above the well bottoms.

Secondary impacts on water resources, i.e., increased population growth and irrigation of certain areas resulting from increased

availability of electrical power, are unavoidable and cannot be mitigated by the Applicant. (See Chapter 3, Water, p. 3-21 .)

VEGETATION

Unavoidable disturbance to vegetation would occur as a result of implementing the proposed project. The areas most affected would be in the salt desert shrub type, as this environment is least receptive to natural revegetation or reseeding. Regrowth within these areas can take serveral decades, and in some circumstances where regrowth does occur, salt desert shrub is usually replaced by invader weed species.

Even in treated areas, the success of revegetation attempts is uncertain. A series of dry years could suppress the newly seeded species. Natural revegetation in this event could take at least ten years.

The availability of new access within the ES area would attract use by recreational vehicles. Although some of these roads would be "put-to-bed" (see Chapter 4, p. 4-5), use might continue, as any vestige of a trail is attractive to four-wheel drive vehicle users. Often, the more primitive the trail, the more attractive it would be. This would have an unavoidable impact on the vegetation of some areas, and could interfere with revegetation efforts.

Table 5-1, p. 5-4 , summarizes unavoidable vegetative impacts resulting from surface disturbance.

Any long-term injury to vegetation or reduction in vegetative vigor because of air pollution from the proposed project would be an unavoidable adverse impact.

WILDLIFE

The implementation of the proposed project would result in some wildlife habitat destruction which cannot be avoided. The climate, soil, vegetation, and existing low density of wildlife able to survive within the ES area all make it difficult to increase the productivity of adjacent areas sufficiently to offset the loss of eliminated habitats.

The disturbance to habitat in Carico and Antelope Valleys, coupled with the potential for increased access and human disturbance, would affect the quality of these areas in relation to the reintroduction of pronghorn antelope.

The construction of roads, towers, tension stations, storage facilities, and communications sites would temporarily disturb wildlife

TABLE 5-1
UNAVOIDABLE IMPACTS TO VEGETATION BY PROJECT SURFACE DISTURBANCE

Vegetative type	Plant complex (acres)	Transmission line corridors (acres)					
		Valmy-Austin				Valmy-Mira Loma	
		AB	AD	CB	CD	EFG	HFG
Shadscale/bud sagebrush	365						
Greasewood/bud sagebrush	74						
Greasewood	54						
Greasewood/saltgrass	405						
Willow (riparian)	14						
Total	912						
Salt desert shrub		121.5	155.2	149.8	183.5	221.6	296.5
Northern desert shrub		117.4	103.7	102.9	89.2	299.9	217.2
Grass		29.0	24.2	12.1	7.3	0.0	4.1
Woodland		12.1	7.3	12.1	7.3	16.9	0.0
Total		280.0	290.4	276.9	287.3	583.4	517.8

and wildlife habitat. This temporary disturbance would be unavoidable.

Alteration of soil and vegetation would affect the ability of the ecosystem to support the existing wildlife species. This alternation of habitat would be unavoidable.

The disturbance of habitat and potential exclusion of mule deer, sage grouse, and non-game animals from construction areas would result in the reduction of suitable habitat and some loss of displaced animals, an impact which would be unavoidable. However, the loss of specific individuals from affected populations would appear insignificant in relation to the overall numbers of wildlife species within the ES area.

LAND USES

Implementation of the proposed project would result in discontinuation of use of 912 acres at the plant site and discontinuation of non-compatible land uses within 795 to 874 acres occupied by transmission line substations, towers, and the remaining trails and access roads for the two lines. This would unavoidably impact public uses of the land for the life of the project.

No cropland is expected to be unavoidably impacted, but there would be a small amount of forage lost from grazing use. This would amount to 46 Animal Unit Months (AUMs) at the project site and a maximum of 42 AUMs along the transmission line corridors, depending on which routes were chosen.

Any minimal disruption (due to the proposed action) that may occur to mining exploration activity and/or operations in mineralized areas would take place only during transmission line construction.

No unavoidable adverse impacts of any siginificance are expected to affect the other land uses.

RECREATION

The loss of up to 1,455 acres of recreation-base public lands (due to transfer of ownership of the project site to the applicant and the designation of the land along the approved corridors as utility rights-of-way) would be unavoidable.

A temporary displacement of an unquantifiable number of recreationists would occur due to equipment traffic, particularly along the transmission lines. This temporary displacement would be unavoidable.

Dust, noise, fumes, and traffic within construction areas would decrease visibility of the affected areas for sightseeing, general leisure, and solitude.

The aesthetic and scenic values of a variety of recreational experiences would be unavoidably diminished to some degree by the presence of the project facilities.

CULTURAL RESOURCES

While avoidance of archaeological sites fully mitigates direct impacts, some loss of scientific information is inherent in salvage of the sites. Since avoidance of all sites is not possible, partial depletion of this nonrenewable resource would be inevitable. In addition, non-avoidance of both archaeological and historical sites would destroy or severely limit any recreational or educational values which they might possess.

The power plant, plant emissions, and power transmission lines may also constitute visual intrusions for undiscovered cultural properties. Vandalism and unintentional damage to cultural resources would probably also occur beyond the actual project sites as a result of increased population and access.

VISUAL RESOURCES

The power plant and associated faciiities would change the natural landscape by creating a major industrial intrusion into a rural area. The effects would appear in the changes of color, form, line, and texture resulting from the clearing, grading, and development of structures, roads, dumps, evaporation ponds, conveyor systems, and transmission lines not in harmony with the natural setting. The impact of man-made contrast would be most severe in areas of high visibility along Interstate 80 and Route 8A. Permanent facilities proposed would create a change to the landscape character that could not be avoided.

The primary impact of the transmission system would be the contrast created in the visual resource. Regardless of the number of mitigating measures applied, the transmission system would still create some degree of visual intrusion into an otherwise natural landscape. Some skylining and encroachment upon areas of high scenic quality would be unavoidable. Vegetative patterns would be interrupted as structures were placed on the landscape. Soil movement would occur and the semiarid areas would recover at a slow rate.

SOCIAL-ECONOMIC CONDITIONS

The impacts of the proposed project on the social-economic factors within the applicant's Service Area and within the ES area cannot be mitigated, and are therefore unavoidable.

Both direct and indirect (secondary) employment generated by the proposed action would increase populations of Winnemucca and Battle Mountain, thereby increasing the need for additional public services.

Public revenues generated by the construction and operation of the proposed power plant would be delayed from the actual time of need by local governments.

Housing would be in short supply within the area, affecting the quality of life for new members of the communities.

Educational capabilities in Battle Mountain could be affected by overextending capacity limitations at Battle Mountain High School.

RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF THE ENVIRONMENT AND THE MAINTENANCE OF LONG-TERM PRODUCTIVITY

6

THE RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

The discussion in this chapter is intended to place in perspective the lasting (long-term) environmental losses which would be exchanged for the temporary (short-term) resource-uses associated with implementation of the proposed project. The purpose is to present a generalized discussion of the trade-offs which would result from carrying out the proposed action. Rather than repeat the quantified impacts detailed in previous chapters, this section will deal briefly with the possible foreclosing of resource-use options to future generations as a result of decisions made to meet immediate or near-future demands.

As used in this chapter, short-term refers to the time period covering construction and placing the project in operation. Long-term refers to the operational life of the project, and beyond. The economic life of the power plant is given as 37 years. It is unrealistic to assume, however, that operation of the plant would cease in this time frame. It would be more realistic to assume that the use of this area for the power plant would continue for many years. In fact, the possibility should not be discounted that at least one more unit could be added to the operation.

In simple terms, the loss of renewable resources (such as vegetation) in the short-term, and of non-renewable resources (such as coal) in the long-term, is exchanged for the availability of more power at the system load centers.

Unit #1 is estimated to use 700,000 tons of coal per year, with a similar quantity being used by the second unit. This would represent a commitment of the coal resource that would preclude its use elsewhere. The combustion of this coal at the North Valmy station would result in deteriorated air quality and reduced visibility within the local airshed in exchange for increased power availability at the load centers which are located in different airsheds.

Similarly, the 8,800 acre-feet per year of water available to the plant operation would be unavailable for other uses in the area for the life of the project.

Passage of transmission lines through or adjacent to areas of high scenic quality such as The Cedars would preclude future generations from enjoying the unobstructed vistas.

Experience of the Bonneville Power Administration (USDI, BPA, Environmental Statement on General Construction and Maintenance Program, 1974) has shown that, in most cases, existing transmission corridors are upgraded in response to increasing demand. In many areas, according to BPA, new transmission lines are being built parallel to existing rights-of-way, further committing the land to utility purposes. Additionally, as long as demand and load centers exist, current rights-of-way will probably continue to be the best available routes from generation sources to the consumer. Although the transmission facilities could be completely removed in 37 years, these are some of the factors that would make this event unlikely.

Sierra Pacific Power Company does plan to use the corridor established by Intertie #2 (Tracy-Hunt 345 kv line) for a parallel 230 kv transmission line if construction is authorized on the second unit of the proposed coal-fired power plant at Valmy, Nevada. (The first unit would use the Tracy-Hunt transmission line to transmit power from Valmy to Reno.) One result of discussing these projects in separate reports is the commitment to two rights-of-way for parallel transmission lines, rather than including the possibility of constructing one double-circuit line (the two transmission systems on a single set of towers).

Some of the long-term effects that could result from implementation of the proposal, regardless of whether or not the facilities themselves remain in place longer than 37 years, include soil loss through erosion, vegetative disruption in the more sensitive areas, the visual impact of construction scars and the towers, increased access into some areas, and future land-use planning decisions resulting from the physical presence of a transmission line in the area. These factors all contribute to a degradation of the recreational resource.

The visual impact of the lines would be felt over the long-term if the towers are not removed at the end of the 37-year project life. Vegetative and soil losses, as well as faunal displacement, cover a proportionally small part of the total ES area, but are still considered important impacts.

A number of secondary long-term impacts could be associated with completion of the project. One would be increased recreational use of the area due to improved access and increased population pressures. Mining and other industrial activities could also expand as a result of increased power availability. In addition, the availability of power is one of the required factors for ag-

ricultural production in the region. Increased agricultural production, in turn, would result in a long-term draw on the groundwater reserves of the hydrographic basins. Calculations (described in Chapter 2, Land Uses, p. 2-52) show this use of groundwater would not exceed the annual recharge. Return flows could add markedly to the salt content of the Humboldt Marshes, however.

In summary, other than the long-term impacts resulting from construction activities, many of the long-term impacts are dependent on the continued existence of the project facilities.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

7

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Irreversible or irretrievable commitments of resources include those commitments which, once initiated, would continue beyond the life of the project (37 years). Resources so committed are not recoverable--once used they cannot be replaced. Projects may be considered as irreversible if, for example, costs make the removal of structures unlikely beyond the project life. Actions which commit future generations to continue a similar course, or which preclude other uses may be considered as irretrievable. In some instances resource commitments can be considered irreversible for the life of a project.

SOILS

Loss of soil productivity on the 912 acres to be occupied by plant site facilities would be an irreversible commitment of the soil resource for as long as the plant facilities are in place. Soil productivity lost while the plant facilities occupy the acreage would be irretrievable.

An unknown amount of soil would be lost from increased erosion during and after construction in the transmission line rights-of-way. For total surface disturbance within each of the right-of-way segments, see Table 1-14 , p. 1-42 . Soil erosion and loss of productivity (until some revegetation occurs) represents an irretrievable commitment of the soil resource.

Soil losses due to water erosion would not be as great if rehabilitation measures are effective. Wind erosion would occur until vegetation reestablishes. This often takes three to five years in areas susceptible to revegetation. Experience indicates that once roads and trails are established, they will continue to be used. Soil loss can be considered as the greatest irretrievable commitment of a resource because of the slow formation in this dry climate. It has been estimated that from 400 to 1,000 years are required to form an inch of soil in this region.

AIR QUALITY

Air quality in the vicinity of the project would be degraded during the life of the project due to pollutants introduced into the atmos-

phere by plant operations. Because the existing air quality can be considered as a resource, its degradation can be considered as an irretrievable commitment of the resource over the life of the project.

Considering that Federal standards exist to prevent significant deterioration of air quality by controlling concentrations of pollutants in ambient air, it is recognized that a project such as the North Valmy proposal may, by its very existence and operational characteristics, effectively preclude other potential projects from being approved in the same area.

VEGETATION

Loss of vegetative production on the 912 acres of public land to be impacted by plant site activities would be an irretrievable loss as long as the plant is in operation.

Areas cleared of plant material would remain in a disturbed state for many years. Plants which do move in tend to be invader species, such as halogeton. The loss of some plant species, chiefly within the salt desert shrub type which is not conducive to artificial revegetation and which has a long delay in natural climax revegetation, can be considered an irretrievable loss of that vegetative resource. This vegetative commitment would be small, because the disturbed areas are minimal in relation to the size of the entire resource. However, the commitment is significant in intensity.

Construction activities would irreversibly change the ecological interrelationships on, and adjacent to, the construction sites by altering the habitats through soil and vegetative disturbance. These localized impacts on ecological interrelationships would not alter the character of the entire ecosystem, but would last as long as the effects of soil and vegetative disturbance persist.

WILDLIFE

The distribution of wildlife species would be altered. Disturbance and increased human activity would cause some sensitive, restricted-habitat species, such as sage grouse and raptors, to leave the area. Species more tolerant of disturbance could move into the altered habitat. This degree of disturbance would not be significant, because the disturbed habitat would be limited to narrow, linear strips of land in the right-of-way and access road areas, and would be temporary, occurring only during construction activities. Plant site disturbance, while permanent during the life of the project, would not involve significant amounts of habitat.

LAND USES

Although the land required by towers and access roads could be returned to its natural state, the land must be considered to be irreversibly committed for the life of the facility, and perhaps longer, since another system could be constructed in its place at a future date. The lands occupied by substations would be irretrievably committed for industrial use. The long-term use of land for transmission corridors and substation sites could lead to land development adjacent to these facilities which would not otherwise occur (i.e., industrial development). Removal of the facilities would not necessarily return the land to its previous use. Public land totaling 940 acres would be transferred to private ownership and would no longer be available for multiple-use management.

CULTURAL AND PALEONTOLOGICAL RESOURCES

Any cultural resources accidentally disrupted during construction would be irreversibly damaged, and could lose much or all of their archaeological or historical value.

Loss of 16 cultural and paleontological sites would be an irretrievable commitment of resources. Even though sites may be salvaged, current limitations in methods of recovery and in analytical techniques would subject the cultural and paleontological investigations to an irretrievable loss of information. Research methods currently being employed destroy the context as the cultural or paleontological article is removed. This method (salvage) limits future opportunities.

VISUAL RESOURCES

There would be a long-term loss to the visual resource. The plant facilities and transmission system would not be dismantled and removed for a minimum of 37 years and would probably remain in place beyond that time. If the facilities were dismantled at a future date, some scars caused by heavy equipment use would remain for generations in spite of revegetation practices. These scars would involve an irreversible commitment of the visual resource within the right-of-way, access road, and plant site areas.

Reduced visibility would be considered as an irretrievable commitment of an existing resource (clear air) for as long as the plant would remain in operation.

COAL RESOURCE AND CONSTRUCTION MATERIALS

Use of the coal resource (700,000 tons per year per unit) to fuel the power plant represents an irreversible and irretrievable loss of that resource once it is burned as fuel.

The aluminum, steel, copper, concrete, and other materials used in the project would be irretrievably committed. Retired equipment may in some cases be reclaimed for use in similar facilities or, if the technology exists, be recycled.

ALTERNATIVES TO THE PROPOSED ACTION

8

ALTERNATIVES TO THE PROPOSED ACTION

This chapter presents a discussion of the impacts that would occur should alternate methods of meeting the project's objectives be implemented, with emphasis placed only on impacts which would be significantly different from those identified for the proposed project in Chapter 3 of this statement.

Major topics presented in the chapter include:

(1) Alternative means of meeting the stated project objectives, including energy conservation and alternate energy sources.

(2) Alternatives to the proposed design and operation of the project including location and fuel delivery.

(3) Alternatives to the proposed transmission systems.

(4) Alternatives to the proposed implementation schedule including the no action alternative.

No discussion of alternate coal sources is included. As stated in Chapter 1 (p. 1-19) the Applicant has contracted 100 percent of the coal for Unit #1 for 22 years from an existing mine. The continuation of this mining operation is not contingent on the Applicant's purchase nor is the North Valmy project dependent on this particular source. Because of these circumstances, the mining operations have not been considered to be a component of the project and have not been evaluated in this environmental statement. It is recognized that existing mine operations are authorized under Federal lease, and the proposed expansion of the mine is the subject of a separate environmental analysis. It is further recognized that when a coal source for the remaining life of Unit #1 and for Unit #2 is identified it will be evaluated and, if located on public land, an environmental analysis may be prepared at that time based on the individual circumstances involved.

ENERGY CONSERVATION

There are presently no statutes requiring conservation of electrical energy for industrial or domestic use. As a result, energy conservation depends primarily on voluntary consumer action.

The three major areas of household energy consumption are water heating, space heating, and air conditioning, all of which offer significant opportunities for conservation. Such basic actions as upgrading insulation, using storm doors and windows, installing weather stripping, and caulking are now actively encouraged as energy conservation measures.

In the near future, more use could be made of solar heating and cooling in new housing. By the year 2000, about 10 percent of the homes in the United States may be equipped with solar systems.

Energy conservation, including supplemental use of solar energy for space and water heating, may not eliminate the need for base load units such as the proposed North Valmy plant; however, taken in total, conservation can have a "dampening" effect on load growth or system demands.

Tangible results of energy conservation can include: longer time frames between new generating projects; more efficient use of finite natural resources; and economic benefits to consumers based on a reduction of purchases of commercially generated power.

The Applicant has initiated a consumer-oriented program designed to inform their customers of various methods of energy conservation. This program includes literature mailings with customers' bills, sale of energy-conserving products such as water heater insulation kits, and a weekly television series demonstrating do-it-yourself energy conservation projects for homeowners.

For further information on the topic of energy conservation, the reader is referred to the Hearing Record of the Joint Hearings of the House Committee on Interstate and Foreign Commerce and the Committee on Banking, Currency, and Housing (July 19 and 20, 1976) dealing with all aspects of energy conservation. Further suggestions for mandatory and voluntary energy conservation measures were published by the Office of Emergency Preparedness (OEP) in 1972. Based on OEP projections, the use of tax incentives to encourage energy efficiency and research and development for new energy sources could result in a 30 percent savings of energy beyond 1980.

A possible incentive for energy conservation would be to change rate structures so kilowatt-hour usage would be made less expensive during off-peak hours, or so usage of electricity becomes increasingly more expensive above certain base levels. The California Public Utilities Commission has directed the Applicant to submit a proposal for time-of-day pricing, and the Applicant has promised the Nevada Public Utilities Commission that it would have an adequate data base by January 1979, to be able to design any time-of-day pricing that would be appropriate for the area.

PURCHASE AND IMPORT POWER

This approach to meeting power demands has been explored by Sierra Pacific, but no power supplies either in the amount needed or in the stated time frames are now available, thus precluding purchases as a viable alternative to the North Valmy project.

Although additional long-term purchases are not a real alternative for the Applicant at this time, they will represent approximately 35 percent of the Applicant's total capability by the end of 1978. Should the entire 500 Megawatt (Mw) capacity of the North Valmy proposal be imported rather than generated within the system, the amount of purchased power would increase to approximately 60 percent of the Applicant's total capacity.

Purchasing power would represent environmental trade-offs when compared with fossil-fueled generation within Sierra Pacific's Service Area. While the plant would not be built, and the identified impacts would be avoided locally, it must be recognized that the additional power would be generated somewhere and that the impacts associated with electrical power generation would in essence only be relocated.

Penalties associated with additional transmission lines include energy losses over distance, visual impacts of the lines, and the additional surface disturbance involved in obtaining access, construction of the lines, and maintenance.

ALTERNATE MEANS OF GENERATION

For a detailed description of the various technologies associated with power generation, the reader is referred to Energy Alternatives: A Comparative Analysis (University of Oklahoma, Science and Public Policy Program, 1975). This report presents a detailed analysis and comparison of the available energy systems, including such topics as technological "state of the art," environmental and economic considerations, and energy efficiencies.

The following summary presents a brief description of the more common systems of electrical generation. Considering the time and need constraints of Sierra Pacific, some of these systems may not appear as realistic alternatives to the proposed project; these systems are discussed here primarily to acquaint the reader with some of the environmental "trade-offs" involved with the differing power generation technologies.

Oil-Gas

An oil- or gas-fired power plant is nearly identical in operating principle to a coal-fired plant. The primary differences in operation are in the type of fuel used, its method of delivery, and the equipment needed to store and burn the fuel.

When compared to a coal-fired plant such as North Valmy, oil or gas generation can offer significant environmental benefits in that they both produce lower emissions of nitrogen oxides, sulfur oxides, and particulates when producing the same amount of energy. Additionally, there is essentially no generation of solid wastes (such as bottom ash) with oil or gas generation.

Due in part to the desirability of gas and oil as a fuel source for industrial and home use, domestic reserves are in short supply. In an attempt to more evenly mix the use of available energy supplies, the Federal Energy Administration (FEA) issued construction orders on June 30, 1975, requiring power plants then in the planning stages (including the North Valmy plant), to use coal as a primary energy source.

On June 30, 1976, FEA issued a "Notice of Effectiveness" to the Applicant. This notice made effective the previously-issued construction order. Since Sierra Pacific Power Company is now required to design a coal-fired plant, an oil- or gas-fired plant is not considered to be a viable alternative to the proposed action with the stated project time frames.

Hydroelectric

Conventional hydroelectric generation uses water moving through a turbine to generate electricity. Typically, a dam is built on a stream to store water in a reservoir; the water is then passed through the turbine and returned to its original watercourse. The essential requirements for a hydroelectric development are an adequate water source in a location which is suitable for dam construction, and creation of the storage reservoir.

A variation of conventional hydroelectric development is called pumped-storage, consisting of two reservoirs or water bodies, one of which is at a higher elevation than the other. Between these bodies of water is a combination pumping-generating station. During periods of low energy-use on a system, the station works as a pump and uses energy to pump water from the lower reservoir to the higher. During peak use periods when additional generation is needed, the water is released from the upper reservoir and the station works as a conventional hydro generator. Pumped-storage installations are designed for peaking capacity and are only used for relatively short time periods. As with conventional hydro installations, both a water supply and a suitable site are required for development of a pumped-storage unit.

The general benefits of hydro generation include the fact that it is essentially a non-consumptive process with the exception of water evaporation from the reservoirs. Hydro generation is clean in that it does not involve combustion or exhaust of pollutants into the atmosphere and is inexpensive (no fuel purchases needed).

The disadvantage of hydroelectric developments include high initial costs for land acquisition and dam construction, the large amounts of land that are flooded for reservoir purposes, the impacts involved in changing a flowing stream to a lake, and the fact that many sites suitable for development have high scenic-recreational values in their natural state.

Because there are no identified hydroelectric sites with sufficient stream flows to meet the stated purpose of the project in the Applicant's Service Area, this alternative is not considered viable.

Nuclear

There are presently three kinds of nuclear plants: light water, gas-cooled, and liquid metal fast-breeder reactors. Nuclear plants use the same steam-cycle principle as fossil-fueled steam plants, the difference being that the source of heat is nuclear reaction rather than chemical combustion.

Nuclear generation offers advantages in that it does not produce the air pollutants associated with fossil-fuel generation; however, nuclear plants produce high emissions of waste heat, requiring more cooling water than fossil-fueled plants. Public concern has been expressed over the possibility of a nuclear plant having a major accident, releasing radioactive materials into the atmosphere.

The lead time required to design, license, and construct a nuclear plant is about ten years. According to the Energy Research and Development Agency (ERDA), the smallest nuclear unit-size that is economically feasible to build is between 1,000 and 1,300 megawatts (Mw). (Personal communication, July, 1977.)

Nuclear generation is not considered a viable alternative to the proposed action for the following reasons:

(1) The lead time required for a nuclear plant exceeds the Applicant's stated time frames.

(2) A need for generating capacities in the 1,000 to 1,300 Mw range does not exist within the Applicant's Service Area.

Geothermal

Geothermal plants use steam or hot water from underground reservoirs to drive turbines to generate electricity. The primary impacts of using geothermal energy are visual intrusion, pollution, waste waters, noise, and odor problems. About 75 percent of the waste steam from a geothermal plant would be evaporated, creating a continuous plume.

Noise associated with a geothermal plant would normally be less than for a comparably sized coal-fired plant, as a geothermal plant would have less mechanical equipment required for day to day operations. However, in the event that the geothermal steam cannot be cycled through the turbines because of a shutdown, it would have to be vented to the atmosphere and in so doing would generate a greater amount of noise than the coal-fired plant.

The steam from geothermal sources is high in dissolved solids and can pollute nearby surface waters. The steam also contains hydrogen sulfide, generating unpleasant odors.

Only one commercial geothermal plant, the Geysers in northern California, is currently operating in the United States.

The visual impacts of the spent steam would be unavoidable, but could be mitigated (along with the odor impact) by locating the units as far as possible from populated areas. Of course, the location of the facilities would be largely dictated by the location of the geothermal field. The waste impact could be mitigated by reinjecting the water into the ground.

Interest in commercial geothermal development in Nevada remains high. It is feasible that commercial units could be in operation in the known geothermal fields of Brady-Hazen and Beowawe by 1990. About eight years lead time is required to develop a known field. Brady-Hazen and Beowave are wet, not dry, steam sources which would be corrosive to turbine blades. This would not preclude commercial development but would be a significant maintenance impact.

In the early stages of development, less than 250 Mw of electricity could be expected to be produced from each field, but potential would exist for further development. With current technology, two 55 Mw generators work together to make one 110 Mw unit. Only a limited number of wells, depending upon the field, are used for a single unit. Although development of these two fields would not occur early enough to substitute for the proposed first unit of the coal-fired North Valmy plant, geothermal development may supply some of the electrical needs of northern Nevada in the foreseeable future.

Solar

Solar energy can be harnessed by direct-conversion photovoltaic cells, steam-cycle conversion plants, and direct thermal use. Photovoltaic cells convert sunlight directly into electricity, although the costs of such electrical generation are several hundred times the cost of power from fossil-fueled plants.

Steam-cycle conversion plants would transfer solar heat to a liquid, such as water, to generate steam to power a turbine. Large areas of reflectors would be needed to concentrate the sun's rays. More research and development are needed to produce practical designs for commercial generating facilities. Large scale use of direct thermal conversion (using solar heat directly) is still in development but may alleviate demands upon commercial power generation in the foreseeable future.

The northern Nevada region receives solar energy in an amount between 1600 and 1700 (British thermal units) Btu's per square foot per day. This is a sizeable amount of solar energy, but present technologies do not permit direct conversion of solar energy to be a viable alternative to the proposed action within the Applicant's stated time frames.

At the present time there are no coordinated efforts to encourage the use of solar energy within the Applicant's Service Area. However, solar energy applications are being tried on an individual basis, particularly for space and water heating.

Wind

Wind power has been used for centuries on a small scale, but technology has not developed to the extent that wind power could be considered a viable alternative to a 250 Mw coal-fired plant.

Like solar power, wind is of low density, requiring large installations in order to gather and convert the available energy. Wind power would represent an essentially non-consumptive and non-polluting source of electrical energy. Impacts from wind generation would primarily involve the large areas of land required for the installations and the visual intrusion of the towers and rotors on the landscape.

Organic Waste

Technology exists for the direct burning of wastes for electrical generation. Solid waste may be burned as supplementary fuel in adapted boilers. Power generation using organic waste as supplemental fuel is about as efficient as that by fossil fuel-fired plants.

Usage of organic waste as a supplementary fuel could conceivably be economical at the North Valmy plant sometime in the future, should the Applicant wish to adapt some equipment to that purpose. Large amounts of waste would be needed to make the procedure worthwhile. Large California metropolitan areas, facing waste disposal problems, may transport by rail their excess waste to fossil fuel-fired plants adapted to utilize it. The proposed North Valmy plant would not necessarily be too distant to receive such shipments.

ALTERNATIVES TO THE PROPOSED DESIGN AND OPERATION OF THE POWER PLANT, INCLUDING LOCATION

Alternative Sites

Site selection for a project such as North Valmy is one of the most significant and earliest decisions required of the Applicant. Once a site is identified by a project sponsor it is possible to move into the work of developing both site-specific designs and the detailed analyses which are required to accompany the applications filed with agencies having permit or approval authority.

In the specific case of Sierra Pacific Power Company's North Valmy proposal, a study titled Power Plant Site Selection Study for the Sierra Pacific Power Project was published in June 1975, by Westinghouse Electric Corporation's Environmental Systems Division. This study focused on five candidate sites and compared economic, social, environmental, and engineering factors. From this study a recommendation was made favoring the North Valmy site.

At the time the site selection study was published, the Applicant made it available to the public and provided copies to the Nevada State Public Service Commission and the Nevada State Clearinghouse, which in turn coordinated a State agency review.

After identification of the preferred project site, the Applicant developed the required environmental reports which were filed with their applications for project approval. The Environmental Report for the North Valmy Station was published in March 1976, with the site selection study summarized and included by reference. This environmental report was filed with Sierra Pacific Power Company's application to the Bureau of Land Management (BLM), the U. S. Environmental Protection Agency (EPA), the Nevada Division of Environmental Protection Services, and the Nevada Public Service Commission. In addition to these filings, BLM has distributed copies to all interested agencies for review and comment and has made the report available to interested groups and individuals. All Nevada State agencies were again given an opportunity to review the proposal through State Clearinghouse review procedures.

The Nevada Public Service Commission (PSC), under the provisions of the Utility Environmental Protection Act, has the responsibility to evaluate the location of proposed facilities. During two sets of public hearings held by the Commission the topic of site selection was addressed. Based on the hearing record the Commission found in part:

> That the location of the proposed facilities of both Valmy Unit No. 1 and Unit No. 2 conforms to the requirements of applicable State laws and regulations considered within this Commission's jurisdiction; and

> That the location of the proposed facilities represents the minimum adverse environmental impact, considering the state of available technology, and the nature and economics of the various alternatives and other pertinent considerations.

In addition to this approval from PSC, a second approval of the site was granted by the Nevada Division of Environmental Protection Services when Registration Certificates were issued for the project under the provisions of the Nevada Air Quality Regulations. (See Chapter 1, p. 1-5 .)

In light of the approvals granted the project, the public exposure given the site selection process, and the absence of controversy concerning the North Valmy site, for purposes of this environmental statement additional detailed site alternatives will not be developed or evaluated.

The following discussion will summarize the sites considered by Westinghouse and will include two "conceptual" sites (a mine-mouth and a load-center alternative). Table 8-1, p. 8-12 , summarizes the site selection sequence, and alternate sites are shown on the map, p. 8-13.

Black Rock Desert

This site is located approximately 70 miles west of Winnemucca on the south edge of the Black Rock Desert near the Western Pacific Railroad tracks. The area is a playa characterized by an almost total lack of vegetation. The site is uninhabited and the nearest communities are Gerlach and Empire some 20 miles to the west. The primary disadvantage of this site is considered to be the extreme difficulty in providing housing and other services to the construction and operational work forces because of the remote nature of the site.

Another significant concern was the fact that water for plant operations would need to be drawn from the groundwater storage at a rate exceeding the recharge.

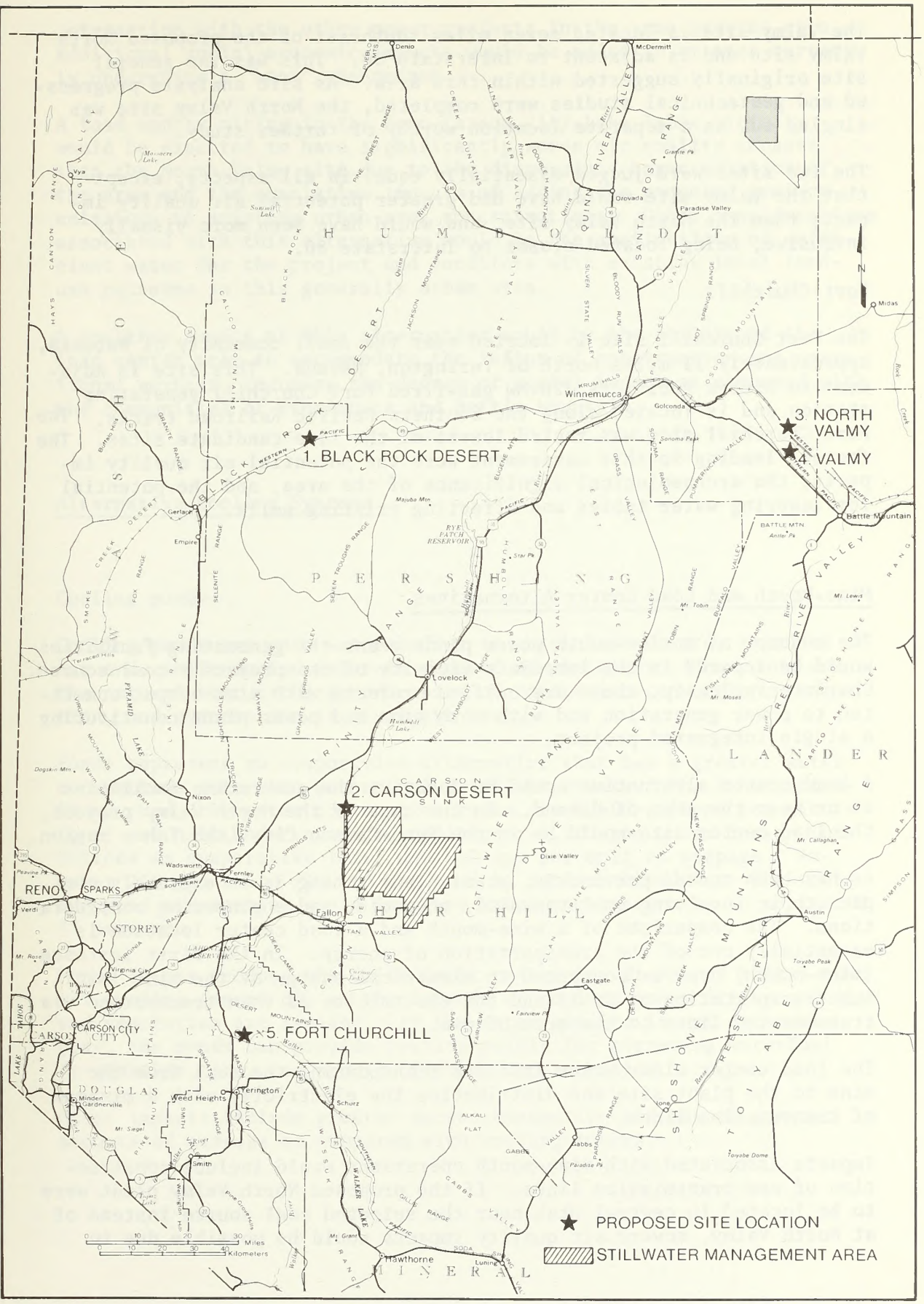
Carson Desert

This site on the western edge of the Carson Sink is approximately 16 miles north of Fallon, Nevada. The site was considered economically and environmentally favorable with one exception which eliminated it from further consideration. The primary concern over the site was its potential for impacts to the water resources at the adjacent Stillwater National Wildlife Management Area, as pumping groundwater for plant use might have reduced the availability of groundwater within the refuge.

TABLE 8-1
SITE SELECTION SEQUENCE

Areas originally considered by Sierra Pacific	Areas identified			
	After preliminary screening for water availability	After preliminary identification of candidate sites	After geotechnical reconnaissance	After detailed site selection evaluation
Boulder Valley	Carson Desert	Black Rock Desert	Black Rock Desert	North Valmy
Carson Desert	Fort Churchill	Carson Desert	Carson Desert	
Desert Valley	Honey Lake Valley	Fort Churchill	Fort Churchill	
Fort Churchill	Smoke Creek	North Valmy	North Valmy	
Honey Lake Valley	Valmy		Valmy	
Imlay				
Lahontan-Silver Springs				
Lovelock Valley				
Lower Reese Valley				
Smoke Creek				
Valmy				
Winnemucca-Golconda				

Adapted from Applicant's Environmental Report.



ADAPTED FROM:
Environmental Report for the North Valmy Station
by Westinghouse Electric Corp. for Sierra Pacific Power Company

ALTERNATIVE SITES

Valmy

The Valmy site is located seven miles southeast of the proposed North Valmy site and is adjacent to Interstate 80. This was the general site originally suggested within this area. As site analysis progressed and geotechnical studies were completed, the North Valmy site was singled out as a separate location worthy of further study.

The two sites were judged essentially equal in all aspects, except that the Valmy site would have had greater potential air quality impacts than the North Valmy site, and would have been more visually intrusive, being located closer to Interstate 80.

Fort Churchill

The Fort Churchill site is located near the small community of Wabuska, approximately 11 miles north of Yerington, Nevada. This site is adjacent to Sierra Pacific's 220-Mw gas-fired Fort Churchill generating station and is located along the Southern Pacific Railroad tracks. The Fort Churchill site was ranked lowest of the five candidate sites. The factors leading to this assessment were the potential air quality impacts, the archaeological significance of the area, and the potential for lowering water tables and affecting existing wells.

Mine-Mouth and Load Center Alternatives

The concept of a mine-mouth power plant means the generating facilities would be located in the immediate vicinity of the project's coal source. Characteristically, these are unified projects with mine output committed to power generation and with both mine and power plant constituting a single integrated project.

A load center alternative would be locating the generating facilities at or near the area of demand. In the case of the North Valmy project, the load center site would be in the Reno-Carson City-Lake Tahoe region.

As has been stated previously, power plant siting is an extremely complex topic involving environmental, economic, and engineering considerations. The comparison of a mine-mouth and a load center location is essentially one of the transportation of energy. In the first instance (mine-mouth) coal is converted to electrical energy at the mine (minimum transportation of fuel) and the electricity is then transported via transmission lines to the area of use.

The load center alternative involves transporting the coal from the mine to the plant site and distributing the electricity with a minimum of transmission lines.

Impacts associated with mine-mouth operations would include construction of new transmission lines. If the proposed North Valmy plant were to be located in central Utah near the selected coal source instead of at North Valmy, severe air quality impacts would be possible due to

interaction with the other power projects in the same general area. Additional social-economic impacts would be added to an area currently undergoing a "boom" phenomenon.

A load center siting in the Reno-Carson City-Lake Tahoe vicinity would be expected to have significantly worse air quality impacts than the North Valmy site due to the dispersion characteristics of the area and the cumulative impacts of adding the proposed project emissions to existing urban area concentrations. Other considerations associated with this alternative would be the availability of sufficient water for the project and conflicts with existing local land-use patterns in this generally urban area.

A positive aspect of this alternative would be the ability of the load center area to accommodate the influx of construction and operational workers, reducing the degree of social impact as compared with the communities of Winnemucca and Battle Mountain.

Alternative Cooling Systems

Cooling ponds

Cooling ponds are open water bodies to which heated water is added at one end, while cooled water is removed at the other. The ponds use the natural heat exchange processes of conduction-convection, radiation, and evaporation to dissipate heat.

Ponds represent an evaporative alternative that has a greater water consumption rate than mechanical draft wet towers. For a bentonite-lined pond, the water consumption rates are 2,600 gallons per minute (gpm) per unit under average conditions; 3,300 gpm under design conditions as evaporative loss; and 113 gpm per unit as seepage. Another 300 gpm would flow to the pond to replace blowdown. The cooling pond alternative would increase water consumption by an estimated 33 percent.

Ponds do not produce the drift (mist containing dissolved salts) that wet cooling towers do, so the impacts of cooling tower drift on soil and vegetation are avoided. If the water quality is not extremely poor, the ponds can provide resting points for migrating waterfowl. In addition, they can provide fishing opportunities.

Other impacts include greater water consumption and use of greater amounts of acreage as compared with cooling towers.

Once Through

"Once through" cooling systems are those in which the water used for condenser cooling is drawn from an existing source such as a lake or river, is passed through the condenser, and is then discharged at a higher temperature back into the original source. These systems are relatively simple and economical as they do not require construction of ponds or towers, but the systems present environmental problems due tothermal pollution resulting from the discharge of the heated water into existing surface waters.

The projected water requirements for a once through system at the proposed two-unit Valmy plant would be 400 cubic feet per second (cfs). The Humboldt River as measured at Battle Mountain (32 years) and Comus (60 years) has recorded average flows of 336 cfs and 289 cfs, respectively.

Because of the insufficient stream flows, once through cooling for the project is not considered to be feasible alternative to the proposed cooling system of the North Valmy project.

Dry Towers

Dry towers operate in much the same manner as an automobile radiator--a closed loop system in which heated water is passed through tubes or fins which dissipate heat to the air passing over them.

The primary benefit of the dry tower cooling system is that it is essentially a non-consumptive system in that no water is lost to evaporation and, therefore, any impacts associated with cooling tower drift deposition would be avoided.

The primary drawback to this system is the energy-use penalty (up to 10 percent more fuel) associated with mechanically moving large amounts of air and water through the large heat-transfer surface area required in this type of system.

Wet Natural Draft Towers

Natural draft cooling towers are similar in operating principle to the system proposed for North Valmy with the exception that air circulates through the towers by naturally induced circulation rather than by mechanical means such as fans.

One of the benefits of the natural draft tower system is there are no energy-use penalties associated with natural circulation as opposed to the use of large fans. However, this is offset by the higher capital cost involved in constructing the natural draft towers which are much larger (up to 500 feet tall and 400 feet wide at the base) than those discussed in the proposed action. Evaporation and drift rates would be essentially the same with either type of cooling tower.

Particulate Control Systems

Particulate removal from exhaust gases is typically accomplished by devices in which particles are trapped and collected prior to releasing the exhaust gases to the atmosphere. The fabric filter system discussed in the Applicant's proposed action is considered to be an efficient system with advantages over most other systems in that it can be continually operated even if some cells are being cleaned or repaired. The fabric filter system is also more effective in collecting the smaller-sized particles.

The summary below discusses other types of particulate removal systems.

Cyclone Collectors. Cyclone collectors, using gravitational and centrifugal forces, separate dust particles from the gas streams. Particle size distribution, particle shape, and specific gravity determine the performance level of these devices. With a particle size distribution of 30 to 40 percent under 19 microns, efficiencies can be as high as 90 percent. Capital costs of mechanical collectors are much lower than for precipitators. The quantity of fly ash and particle size distribution at the proposed plant is expected to be such that Federal and Nevada State emission and opacity standards would be exceeded if cyclone collectors alone were employed to control particulate emissions. Thus, cyclone collectors are not considered a viable alternative to the proposed system.

Electrostatic Precipitators. Electrostatic precipitators are devices which remove particulates from combustion gases by inducing an electrical charge to the particles and then attracting them out of the flow of exhaust gases.

Precipitators consist of a parallel configuration of highly charged plates and wires or tubes. As the flow of gases passes between the wires or tubes the particles become charged and are drawn to the collector plates. The plates are in turn rapped or vibrated causing the collected particles to drop into collection bins for disposal.

Electrostatic precipitators are the most common particulate control devices now in use at larger power plants. Compared with fabric filtration, precipitators are physically smaller units and are somewhat less efficient. Impacts to air quality with this system would be similar to those discussed in Chapter 3.

Wet Collection (Venturi Scrubbers). A venturi-type scrubber for removal of particulates is a high-energy wet scrubber and has many industrial applications. The flue gas and liquid are accelerated through a small diameter throat, atomizing the scrubber liquid. Efficient scrubbing requires that the liquid be atomized to a fineness

which will afford maximum contact with the particles to be collected. The particles collide with the water droplets, adhere to them, and are collected. The fly ash is removed in a slurry.

Advantages of this system are that venturi-type scrubbers require less space than baghouses and electrostatic precipitators, and fly ash is removed in a slurry. The high pressure drop across the system results in efficient particulate collection. The wet system also removes some sulfur dioxide from the flue gas stream.

Disadvantages of the venturi system are high water consumption for slurry removal of the ash and high fuel and power consumption because of the high pressure drop requirements. Another drawback is that partical bypass of the flue gas desulfurization (FGD) system in order to reheat the flue gas would not be feasible, since the flue gas would be saturated by the particulate scrubber.

Desulfurization

The proposed North Valmy station has been reviewed and analyzed under the assumption that no sulfur controls would be utilized. This section will discuss, as an alternative, the impacts associated with operating the plant with a flue gas desulfurization (FGD) system.

While FGD technology is still being developed, limestone throw-away systems (scrubbers) are a common type, and will be used for purposes of this discussion.

In simple terms, a scrubber works by contacting the combustion (flue) gases with a wet limestone slurry resulting in a chemical reaction which removes the sulfur dioxide (SO_2) from the gas. The "scrubbed" gases are then released to the atmosphere while the slurry sludge is disposed of as solid waste.

Table 8-2, p. 8-19 , shows the most probable emission rates based on SUFCO coal which has a heating value of 11,400 Btu/lb., a sulfur content of 0.45 percent, and an ash content of 9.0 percent. The table also shows emissions for three levels of scrubbing.

For comparison of these expected emission rates with the allowable rates, see Table 3-3, p. 3-12 .

The initial cost of installing a scrubbing system does not vary in proportion to the amount of scrubbing to be done because only the number of scrubber cells varies. Operation and maintenance costs, however, are proportional to the energy required to operate the scrubber system.

The energy levels that would need to be tapped from the plant's electrical output lines to operate the scrubbers are as follows. For 90 percent SO_2 removal, all the flue gases would have to go through the scrubbers, and there would be a heat energy penalty (as well as an

TABLE 8-2
EMISSION RATES PER UNIT

Pollutant	Emissions without scrubbing	Removal of SO_2 10 percent	50 percent	90 percent
	(grams per second)			
Sulfur dioxide	246	221	123	25
Nitrogen dioxide	220	220	220	220
Particulate matter	4.9	4.6	3.5	2.5

Source: Applicant's Environmental Report.

electrical energy penalty) because the gases would then have to be reheated to go up the stack. About four megawatts (Mw) of electricity would be required to operate the scrubbers at 90 percent SO_2 removal. At 50 percent SO_2 removal, 2.3 Mw would be required to operate the scrubbers. At 10 percent removal, 0.5 Mw would be needed.

Although there is a direct correlation between emission rates and the level of SO_2 scrubbing, there is not necessarily a direct correlation between the level of scrubbing and the ambient air quality, since ambient air quality also depends on the temperature of the plume (and the distance it travels) which is cooled by the scrubbing process. Therefore, the scrubbed plume gases (which are cooler) may travel shorter distances and undergo less mixing with the atmosphere, resulting in less dilution of emissions.

If 25 percent of the sulfur were removed from the flue gases, about 25 tons of limestone per day would be needed for two units. At this scrubbing level, about 2,500 pounds per hour of SO_2 scrubber sludge would be mixed with the fly ash and trucked to a landfill disposal site. The estimated volumes of scrubber sludge produced would be 0.4 cubic yards per hour per unit at 100 percent load, and 200,000 cubic yards per unit over 37 years.

A minimum of 250,000 cubic yards of limestone would be required to furnish two 250-Mw units at 90 percent scrubbing for 37 years.

Several potential sources of limestone have been identified in the vicinity of the North Valmy site. Should some type of FGD system eventually be required, these sources could be further examined as potential quarry sites (with environmental analyses completed as required).

Without knowing the degree of sulfur removal that may be required or the technology that may be available, it is impossible to predict limestone requirements more specifically.

Depending on the amount of sulfur removal desired and the available technology, it is possible that other FGD systems may be available in the reasonably near future. One such system (currently being investigated by the Applicant) would utilize the baghouse, and would work as a dry system using a catalyst in the baghouse to remove SO_2. The dry waste is captured by the catalyst and disposed of with the fly ash.

Alternative Coal Transportation

Slurry Pipelines

Slurry pipelines can transport pulverized coal suspended in water from the mine to the plant site. The coal must first be processed to obtain the proper particle size. Pumping stations, dewatering and storage facilities are also required. When coal is transported over long distances, the operating costs are low, but capital costs are high and water requirements substantial.

The coal-water slurry would consist of about 45 percent coal and 55 percent water by weight. Depending upon final route selection, between 300 and 350 miles of 10 to 12 inch pipe would be required. The slurry preparation plant at the mine site would require five to six Mw of power per year (as scaled from other installations elsewhere). At the plant site, an additional settling pond and filtering system with related facilities would be needed.

The major drawbacks to the slurry pipeline alternative are the substantial water requirement and the high capital cost. A typical coal slurry pipeline requires approximately 11 million gallons per 10^{12} Btu's of coal input (Energy Alternatives: A Comparative Analysis, 1975). The costs of pipeline design and construction would compare unfavorably with the fact that rail service already exists between the mine and proposed plant site.

ALTERNATIVES TO IMPLEMENTATION AUTHORIZATIONS AND SCHEDULES

Authorizing Actions

Sierra Pacific Power Company has expressed its intent to acquire title to 940 acres of public land for the proposed project. The other possible authorization which will be explored is the possibility of retaining the lands in Federal ownership with use authorization given through a right-of-way grant. Should the Applicant be given less than fee simple title to the identified lands, these lands would be available for other compatible public purposes. The lands would be returned to multiple management upon termination of the right-of-way. This alternative would require careful examination by both BLM and the Applicant because of the implications for project funding on lands not wholly owned by the Applicant. The right-of-way grant would contain stipulations for the transmission line right-of-way similar to those found in Chapter 4 of this statement.

Delay of Construction

A delay in bringing Unit #1 into operation would result in failure of the Sierra Pacific system to adhere to its reliability criteria. The system would not be expected to meet the demands of the 1982-1983 winter peak without Unit #1. A delay in the proposed action, in effect, occurred when the Nevada Public Service Commission refused to grant a permit for the second 250 Mw unit, with the Applicant now having to provide additional data on need for the second unit at a later date.

The impact of delayed construction is extremely difficult to assess. Technological advances could be developed during a delay period which could lead to more efficient or cleaner project operations. If it is assumed that predicted impacts would remain constant, then a delay would only move these impacts back in time, but would not reduce or eliminate any of them.

No Action Alternative

In the case of the North Valmy proposal the no action alternative may be interpreted in two ways. If no action is construed to mean that Sierra Pacific Power Company's applications to use and/or acquire public lands are denied, then the result would probably be that the project would be relocated onto private lands with subsequent modifications to the proposed transmission line alignments. In this case the impacts of the proposed project would remain essentially the same, being relocated rather than avoided or eliminated.

If no action is construed to mean that the project itself is eliminated, then a different situation occurs. If no additional power is available to the Applicant's system, reliability criteria would not be met. If no project is built the resources such as coal and water would not be used and would be available for other purposes. All impacts resulting from project implementation would be avoided.

TRANSMISSION LINE ALTERNATIVES

The Applicant's Environmental Report discussed several possible alignments for the proposed transmission lines. Not all of these alternatives have been presented here; however, the ones included were felt to offer the best representative alignments. With the one exception discussed below, alternative alignments have been discussed in the earlier chapters of this statement and are not presented in this chapter as alternatives to the proposed action.

Alternative Routes

An alternative transmission line routing (suggested by the Battle Mountain BLM staff) calls for a variation of segment B of the proposed Valmy-Austin line. (See the Alternative Segment Map, p. 8- .) This alternative crossing of the Shoshone Mountains would pass through gentler, more open country to the south of the proposed routing and would avoid the scenic areas of The Cedars crossing. The suggested variation would not change the length of segment B.

A further feature of this alignment is that it generally parallels Highway 8A and would allow for a total Valmy-Austin routing following the existing transportation corridors.

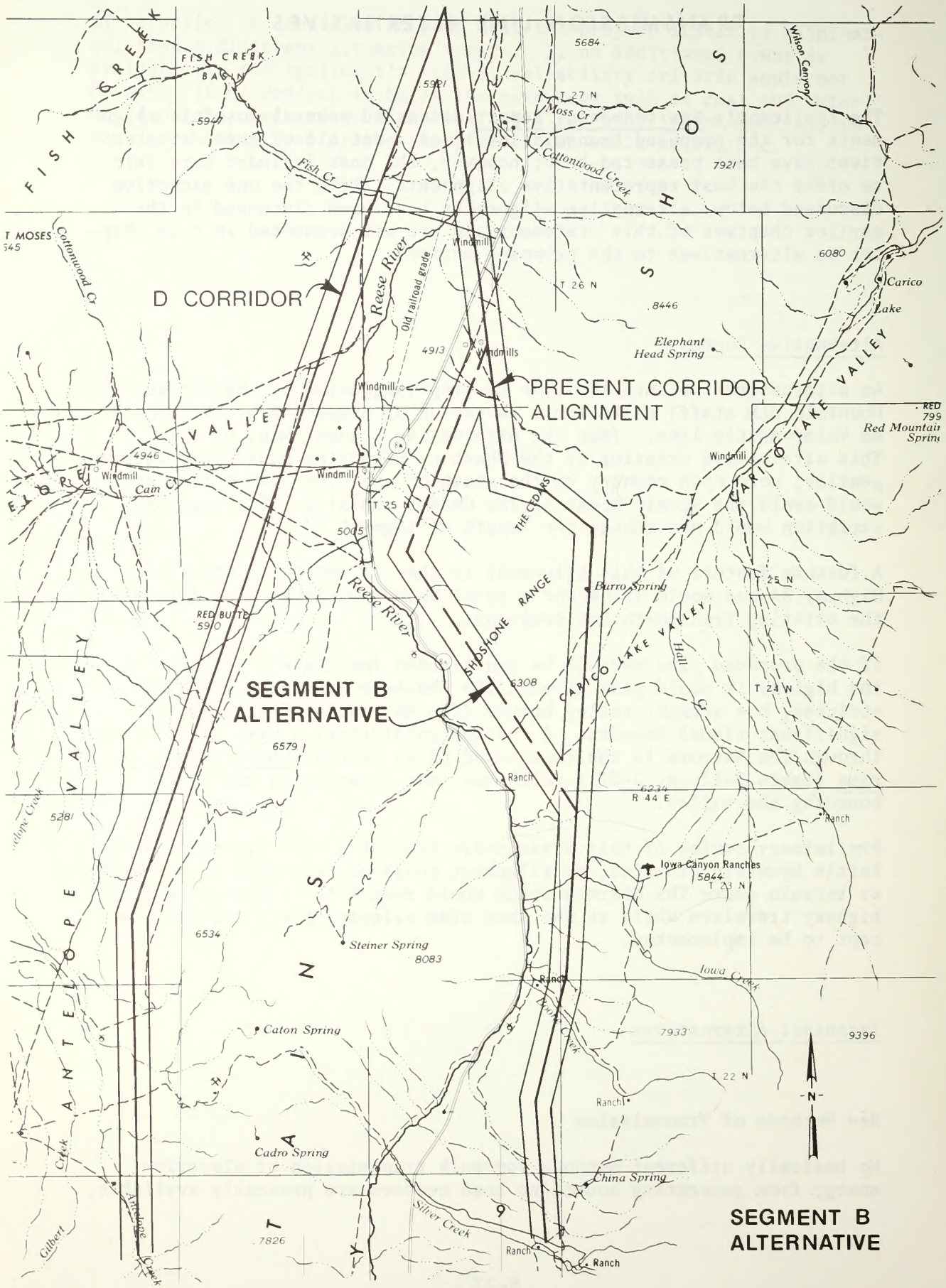
If the proposed line were to be constructed immediately adjacent to the highway it would pass through the Shoshone Mountains via a constricted, but scenic, valley bottom (The Narrows) and would create significant visual impacts. A further consideration with any routing through The Narrows is the threatened plant species Phacelia glaberrima (Table 2-12, p. 2-30) which has been reported on the bluffs bounding the valley.

Preliminary review of this alternative indicates, as suggested by the Battle Mountain District, an alignment could be developed on the higher terrain above The Narrows which would reduce the visual impact to highway travelers while at the same time allowing for a corridor concept to be implemented.

Technical Alternatives

New Methods of Transmission

No basically different methods for bulk transmission of electric energy from generating source to load centers are presently available.


D CORRIDOR
PRESENT CORRIDOR ALIGNMENT
SEGMENT B ALTERNATIVE
SEGMENT B ALTERNATIVE
Reese River
Old railroad grade
Fish Cr
Moss Cr
Cottonwood Creek
Wilson Canyon
Carico Lake Valley
Elephant Head Spring
Carico Lake
Red Mountain Spring
Cain Cr
Reese River Valley
Shoshone Range
The Cedars
Burro Spring
Hall Cr
Iowa Canyon Ranches
Iowa Creek
Steiner Spring
Caton Spring
Cadro Spring
China Spring
Silver Creek
Antelope Creek
Gilbert Creek
Fish Creek Basin
Fish Creek
Cottonwood Cr
Windmill
Windmills
Ranch
RED BUTTE
5910
T 27 N
T 26 N
T 25 N
T 24 N
T 23 N
T 22 N
R 44 E
5684
5921
5944
7921
8446
6080
4913
4946
5005
6308
6579
6534
8083
7933
9396
7826
5281
6234
5844

Various groups are conducting research into possibilities of microwave and laser transmission of energy and improved storage devices. However, these methods will not be practical for many years and cannot be considered as an alternative to the proposed action at this time (USDI, Bonneville Power Administration, General Construction and Maintenance Program, 1974).

Undergrounding

Technology in the field of undergrounding high voltage transmission lines has not progressed to the point where such an action can compete economically with overhead transmission lines. This method of energy transmission would require use of a trench-constructed corridor which can cause considerable disruption of the environment, particularly in arid country along the proposed route. The rights-of-way would have to be cleared along the entire route to permit trench construction and to allow the installation of the underground transmission lines, cooling system, and other necessary equipment. Also, a backfilled trench, if it is on a slope, is difficult to stablize in order to prevent longitudinal erosion. Soil erosion would be severe due to the extensive soil disturbance, the need to trench straight up hills, and the slow recovery time of vegetation on the disturbed soil profile. In general, the main benefit from undergrounding would be in the elimination of overhead intrusions (and thus, visual impacts) but, the effect of trenching and the resultant erosion and revegetation problems would create more surface impacts than the conventional methods of building transmission lines.

Multiple-Circuit Towers

Double-circuit construction allows the transmission of electricity over one transmission line structure equivalent to that transmitted over two conventional lines. The obvious appeal of double-circuit towers is the narrower right-of-way which could accommodate two parallel lines. Although total right-of-way area may not be as large (double-circuit), the steel towers required would need more base area, and higher-standard access roads would probably be needed for construction of double-circuit towers. However, the greatest problem with the double-circuit technique is that the reliability of power delivery would be reduced, thus making this type of design undesirable to the Applicant.

CONSULTATION AND COORDINATION

9

CONSULTATION AND COORDINATION

CONSULTATION AND COORDINATION IN THE PREPARATION OF THE DRAFT ENVIRONMENTAL STATEMENT

During the preparation of the draft environmental statement (DES) the team was in contact with other Federal offices, State and local agencies, interest groups, and individuals. Communication varied from formal written comment to informal personal contact. Information concerning the proposed project and BLM's role in the project was extensively covered in the local media.

A list of agencies contacted by letter follows. Each letter was accompanied by a copy of the Applicant's Environmental Report and requested comment as to adequacy of the project description; responsibility for licensing, permits, reviews or other regulatory functions the agency might have; adequacy of impact analysis; projects or plans which might be affected by the proposal; and other areas of interest or concern. An asterisk indicates those from whom the Environmental Coordination Staff received either a verbal or written response. Where a specific recommendation was made or conflict identified, that response has been briefly identified. Several aspects of the project have been modified since these comments were received, but the pertinent responses were considered in the preparation of the DES.

Bureau of Indian Affairs
Department of Housing and Urban Development
Federal Highway Administration
Department of Commerce, Reno Field Services Office

Environmental Protection Agency (EPA)*
The team was in close contact with the EPA during the preparation of the draft. EPA's analysis showed the Applicant's figures for emission rates were acceptable, although their own modeling indicated that some violation of the significant deterioration increment for sulfur dioxide (SO_2) could conceivably occur under worst-case conditions. Correspondence from EPA stated:

> To avoid making an arbitrary decision on model accuracy, it was suggested in the meeting of 24 May [1977] that Sierra Pacific Power build one of the two units and mon-

itor after start-up. If the results of this monitoring show that WESD estimates were correct, then Sierra Pacific Power would be permitted to build a second unit. John Saibini of Sierra Pacific Power accepted this approach. Details remain to be resolved.

U. S. Fish and Wildlife Service*
Written comments from the Boise office suggested a number of points which should be considered in the preparation of the ES. Consultation in accordance with Section 7 of the Endangered Species Act has been initiated with the Portland Regional Office.

U. S. Geological Survey*
Written comments on the Westinghouse treatment of soils, geologic structure, and earthquakes were provided.

Bonneville Power Administration*
Written comments indicated it was unclear why a 21.3 square mile site had been provided. They also responded to Westinghouse coverage of radio and television interference and noise levels.

Federal Communications Commission (FCC)*
The description of the proposed communication facilities and antennae sites as provided in the Applicant's Environmental Report was considered satisfactory for the FCC's requirements. The facilities do not constitute a "major action" under the National Environmental Policy Act as far as the FCC's regulations are concerned.

U. S. Forest Service, Toiyabe National Forest*
This agency's only comment concerned the impact of appropriating 5,000 gallons per minute of water for the operation, and the potential effects on the Humboldt River and Humboldt Sink. They suggested additional consideration of this point.

U. S. Forest Service, Fish Lake National Forest*
Provided information on mine operation.

National Park Service*
The agency provided technical assistance on treatment of cultural resources.

Army Corps of Engineers*
No Corps projects would be affected by proposed power plant construction. A Department of the Army permit is not required under Section 404 of Public Law 92-500.

Bureau of Outdoor Recreation*
Written comments suggested further examination of future energy demand possibilities and expansion of the discussion on energy conservation.

Department of Energy
No comments were provided, as their expertise is not pertinent to the proposed action.

Federal Aviation Administration (FAA)*
Aircraft obstruction marking and lighting should be considered for the power plant stacks. FAA Form 7460-1, "Notice of Construction or Alteration," must be filed with the Western Regional Office of the FAA.

Federal Power Commission (FPC)*
The FPC's interest concerned the relationship of the electrical capacity of the prospective power supply and demand situation of the systems and regions involved; the fuel supply situation related to the type of plant and its environmental effects; and an alternative means of meeting the power supply needs for which Sierra Pacific's plant is proposed. The Applicant's forecast showed the need for additional capacity.

Rural Electrification Administration (REA)*
The REA should have no regulatory or licensing function concerning the project, but the project could have a positive effect on one of REA's borrowers, Wells Rural Electric Company at Wells, Nevada. It might prove feasible in the future for Wells to tap the Tracy-Hunt line (Intertie #2) to establish an alternative source of supply.

Soil Conservation Service (SCS)*
The SCS reviewed the Applicant's Environmental Report and had no comments.

Bureau of Reclamation*
Written comments included suggestions on graphics, road and rail traffic during construction and operation, transmission line routings and location of the parallel right-of-way (the proposed line should be located adjacent to existing lines unless reliability or other specific problems exist). A fire plan should be included, and Sierra Pacific's investigations on solar, wind, and geothermal power should be briefly summarized.

Bureau of Mines*
Written comments directed the Bureau of Land Management (BLM) to the Mining Enforcement and Safety Administration for matters of mine health and safety. They also suggested appending tables to the report showing use and quantities of construction aggregate, ferrous and non-ferrous metals, and petroleum products. The project as proposed should have no adverse impacts on mineral development in the area.

Advisory Council on Historic Preservation*
Written remarks outline the type of documentation of cultural resources which should be included in the ES.

Mining Enforcement and Safety Administration (MESA)*
MESA reviewed the Applicant's Environmental Report and concluded that they have no interest in such reports. They requested no additional documents on environmental subjects be sent for review.

U. S. Naval Air Station, Fallon, Nevada*
The Navy saw no potential conflict in connection with the Valmy to Mira Loma transmission line which would parallel the existing Tracy-Oreana line.

Nevada State Clearinghouse*
Department of Highways. The Highway Department requires a plan review and approval prior to all work entering or crossing the highway right-of-way. The Department suggested that the Applicant may be required to erect, maintain, and operate warning signs to keep the traveling public apprised of roadway conditions in the event of fogging or icing of Interstate 80.

State Division of Parks (Historical Preservation Officer). At the time the Clearinghouse was first contacted, the National Park Service had declared the staff of the Nevada State Historic Preservation Officer (SHPO) ineligible to make determinations on proposed actions of agencies in areas of potential historic or archaeological significance. The ES team was referred to the Advisory Council on Historic Preservation. The SHPO has since been reinstated and will have the opportunity to review the DES.

Nevada Historical Society. The Society stated that historical aspects were adequately covered in the Applicant's Environmental Report.

Division of State Lands. The Division commented on possible preclusion of other industrial development in the area because the Class II significant deterioration increment for SO_2 would be used by the proposed plant.

Nevada State Museum. The Museum conducted the archaeological and historical reconnaissance of the proposed plant site. The Museum stated that the Applicant's Environmental Report accurately represented the Museum's conclusions.

Department of Fish and Game (DF&G). Comments expressed concern with protective measures applied to the evaporative ponds. The Department suggested cables be stretched across these ponds to discourage use by waterfowl or other birds. Specific placement distances would be supplied by DF&G upon request.

Department of Agriculture. No comment.

Employment Security Department. No comment on the report. The Winnemucca Employment Security Office would be available to assist in meeting the labor force requirements if and when the project is implemented.

Environmental Protection Services. Detailed comments on air quality were submitted. The ES team was in close contact with the State Air Quality Office during development of that portion of the ES.

County commissioners and planning commissions in the Applicant's Service Area (12 counties) were notified by letter of the ES effort. Information was requested on any jurisdictional or regulatory responsibility the counties might have in relation to the proposed project, or if the project might conflict with any current or proposed land use planning. Responses were received from the Humboldt County Board of Commissioners, the Pershing County Board of Commissioners, and the Churchill County Planning Commission. Humboldt County viewed the area in the vicinity of the proposed power plant as remaining rural and agricultural in character, and would not encourage extensive development of urban uses in the area. No other concerns were raised by the respondents.

A wide sector of public interest groups was contacted by letter concerning the proposed project. These ranged from environmental groups and civic organizations to Nevada's congressional delegation. Fifty-six groups and several private citizens were contacted. One response, from Senator Paul Laxalt, was received.

In addition, a notice of intent to prepare an ES on the proposed project was published in the Federal Register, Wednesday, July 21, 1976. Four inquiries were received in response to this notice. In two cases, the Applicant's Environmental Report was requested, reviewed, and comments were returned to the ES team. These comments were considered in the preparation of the DES.

COORDINATION IN THE REVIEW OF THE DRAFT ENVIRONMENTAL STATEMENT

Requests for comments on the DES will be made of the following interest groups and agencies:

Congressional delegation, Nevada
- Senator Howard Cannon
- Senator Paul Laxalt
- Representative James Santini

Federal
- Advisory Council on Historic Preservation
- Department of Agriculture
  - Forest Service
  - Soil Conservation Service
  - Rural Electrification Administration
- Department of Defense
  - Army Corps of Engineers
- Department of Health, Education and Welfare
- Department of Housing and Urban Development
- Department of the Interior
  - Bonneville Power Administration
  - Bureau of Indian Affairs
  - Bureau of Outdoor Recreation
  - Bureau of Reclamation
  - National Park Service
  - U. S. Fish and Wildlife Service
  - U. S. Geological Survey
- Department of Transportation
- Environmental Protection Agency
- Federal Energy Administration
- Federal Power Commission
- Federal Communications Commission

State
- Office of the Governor, Nevada
- Nevada State Historic Preservation Officer
- Nevada State Clearinghouse (25 copies) - distributes copies to State agencies
- Tahoe Regional Planning Agency

Local
- Carson City Board of Supervisors and Planning Commission
- Churchill County Commissioners and Planning Commission
- Esmeralda County Commissioners and Planning Commission
- Eureka County Commissioners and Planning Commission
- Humboldt County Commissioners and Planning Commission
- Lander County Commissioners and Planning Commission
- Lyon County Commissioners and Planning Commission
- Mineral County Commissioners and Planning Commission
- Nye County Commissioners and Planning Commission

Pershing County Commissioners and Planning Commission
Regional Planning Commission, Reno, Sparks, and Washoe County
Storey County Commissioners and Planning Commission
Washoe Council of Governments
Washoe County Commissioners

Interest Groups

Citizens Alert
Foresta Institute
Intertribal Council of Nevada
League of Women Voters, Nevada
Natural Resources Defense Council
Nevada Outdoor Recreation Association
Sierra Club
The Wilderness Society
University of Nevada, Reno
Washoe County Legal Aid Society

Requests for comments will also be made of all private citizens who have requested copies of the DES.

Copies of the draft environmental statement will be available for public review at the following locations:

Bureau of Land Management Offices

Office of Public Affairs, BLM
18th and C Streets
Washington, D. C. 20240

Nevada State Office
Room 3008 Federal Building
300 Booth Street
Reno, Nevada 89509

Battle Mountain District Office
North 2nd and South Scott Streets
Battle Mountain, Nevada 89820

Carson City District Office
1050 E. Williams Street
Carson City, Nevada 89701

Elko District Office
2002 Idaho Street
Elko, Nevada 89801

Ely District Office
Star Route 5, Box 1
Ely, Nevada 89301

Las Vegas District Office
4765 West Vegas
Las Vegas, Nevada 89102

Winnemucca District Office
705 East 4th Street
Winnemucca, Nevada 89445

Public libraries

Battle Mountain Branch Library
315 South Humboldt
Battle Mountain, Nevada 89820

Churchill County Library
553 South Maine Street
Fallon, Nevada 89406

Clark County Library
1401 East Flamingo Road
Las Vegas, Nevada 89109

Elko County Library
720 Court Street
Elko, Nevada 89801

Humboldt County Library
85 East 5th Street
Winnemucca, Nevada 89445

Ormsby Public Library
900 North Roop
Carson City, Nevada 89701

Pershing County Library
1125 Central Avenue
Lovelock, Nevada 89419

Washoe County Library
301 South Center Street
Reno, Nevada 89501

PUBLIC HEARING

A public hearing will be held in Reno (and possibly one other location) on this Draft Environmental Statement. Notices of dates and times for any public meetings will be announced in advance through the public media.

APPENDICES

APPENDIX A

CLIMATE

TABLE A-1
SUMMARY OF CLIMATOLOGICAL FEATURES
WINNEMUCCA, NEVADA

Feature	Period	Amount (inches)	Temperature (°F)	Relative humidity (percent)	Direction (mph)
Precipitation:					
Normal annual total		8.47			
Maximum monthly	June 1958	2.86			
Minimum monthly	Sept 1974	0.00			
Maximum 24 hours	June 1958	1.79			
Snowfall:					
Monthly maximum	March 1952	23.4			
Maximum 24 hours	Feb 1959	9.9			
Temperature:					
Mean annual			47.9		
Record high	July 1931		108.0		
Record low	Jan 1937		-36.0		
Average relative humidity by hours of the day (local time):					
Hour	0400			64	
Hour	1000			43	
Hour	1600			34	
Hour	2200			54	
Wind:					
Prevailing direction					South
Mean speed					6.9

Source: Applicant's Environmental Report.

TABLE A-2
PRECIPITATION

Location	No. of ears Recorded	Average precipitation (inches)												
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Austin	30	1.06	1.12	1.51	1.49	1.33	1.13	0.56	0.51	0.47	1.07	0.93	1.08	12.26
Battle Mountain Airport	30	0.71	0.67	0.66	0.75	0.92	0.85	0.30	0.22	0.32	0.71	0.66	0.69	7.46
Fallon Experimental Station	30	0.50	0.63	0.55	0.38	0.73	0.45	0.19	0.17	0.22	0.42	0.36	0.46	5.06
Imlay	25	0.72	0.66	0.60	0.61	0.83	0.67	0.19	0.10	0.21	0.69	0.58	0.78	6.64
Lahontan Dam	30	0.46	0.42	0.33	0.27	0.50	0.41	0.19	0.23	0.25	0.48	0.46	0.44	4.44
Lovelock	30	0.65	0.60	0.45	0.42	0.67	0.55	0.17	0.21	0.15	0.52	0.44	0.46	5.29
Reno Airport	30	1.21	0.86	0.70	0.47	0.66	0.40	0.26	0.22	0.23	0.42	0.68	1.09	7.20
Rye Patch	30	0.74	0.63	0.57	0.65	0.97	0.89	0.31	0.29	0.27	0.54	0.69	0.59	7.14
Winnemucca	30	0.97	0.81	0.71	0.73	0.91	1.01	0.23	0.26	0.28	0.65	0.97	0.94	8.47

Source: Applicant's Environmental Report.

TABLE A-3
MONTHLY PRECIPITATION SUMMARIES
(WINNEMUCCA WEATHER STATION)

Month	Rain (inches)				Snow and ice pellets (inches)		
	Normal total	Monthly		Maximum in 24-hour	Mean total	Maximum	
		Maximum	Minimum			Monthly	24-hour
Jan	1.05	2.70	0.04	0.67	5.9	33.0	18.2
Feb	0.94	2.17	0.08	0.72	3.8	13.8	9.9
Mar	0.81	5.23	0.06	0.60	4.7	23.4	8.7
Apr	0.82	1.86	0.06	1.01	2.9	12.0	7.2
May	0.94	2.82	Trace	0.97	0.7	5.4	4.3
Jun	0.76	2.86	Trace	1.79	Trace	Trace	Trace
Jul	0.27	0.92	0.00	0.63	0.0	0.0	0.0
Aug	0.15	1.26	0.00	0.75	0.0	0.0	0.0
Sep	0.34	1.26	0.00	0.79	Trace	0.2	0.2
Oct	0.81	2.19	Trace	1.64	0.4	3.5	3.5
Nov	0.80	2.66	Trace	1.58	2.1	8.6	5.7
Dec	0.94	2.54	0.26	0.95	5.2	17.5	8.4
Year	8.63	5.23	0.00	1.79	25.7	33.0	18.2
Length of record (years)	30	25	25	25	25	25	25

Source: Applicant's Environmental Report.

TABLE A-4
MAXIMUM CALCULATED POINT RAINFALL VALUES IN VALMY SITE AREA FOR DURATIONS FROM 30 MINUTES TO 24 HOURS AND RETURN PERIODS OF 25 TO 50 YEARS

Return period (years)	Precipitation (inches)						
	30 min	1 hr	2 hr	3 hr	6 hr	12 hr	24 hr
25	0.5	0.6	0.75	0.9	1.1	1.5	1.75
50	0.6	0.7	0.9	1.0	1.4	1.6	2.0

TABLE A-5
MAXIMUM RECORDED POINT RAINFALL IN INCHES
FOR 5 MINUTES TO 24 HOURS

Minutes (inches)					Hours (inches)				
5	10	15	30	60	2	3	6	12	24
0.4	0.57	0.77	1.02	1.10	1.10	1.10	1.35	1.56	1.79

TABLE A-6
MONTHLY MEAN THUNDERSTORM DAYS
WINNEMUCCA, NEVADA

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Thunderstorm days	*	*	*	1	2	3	3	3	2	1	*	*	15

* Less than 1/2 day.

Source: Applicant's Environmental Report.

TABLE A-7
MEAN TEMPERATURES SUMMARY

Location	Years of record	Elevation	Daily mean		Mean monthly
			Maximum	Minimum	
Austin	30	6,543 feet	60.9 F	33.9 F	47.2 F
Battle Mountain	30	4,513 feet	65.4 F	31.4 F	48.4 F
Fallon	30	3,965 feet	67.7 F	34.7 F	51.5 F
Lahontan Dam	30	4,158 feet	66.9 F	41.2 F	54.0 F
Lovelock	30	3,977 feet	67.9 F	36.1 F	52.1 F
Reno	30	4,404 feet	66.6 F	32.8 F	49.7 F
Rye Patch	30	4,135 feet	67.6 F	33.3 F	50.5 F

Source: National Oceanic and Atmospheric Administration, Climatological Summaries.

TABLE A-8
MONTHLY TEMPERATURE SUMMARIES
(WINNEMUCCA WEATHER STATION)

	Temperature (degree Fahrenheit)				
	Mean			Record	
Month	Maximum	Minimum	Monthly	Highest	Lowest
Jan	39.7	14.7	27.2	68	-36
Feb	44.8	19.7	32.3	69	- 9
Mar	53.0	23.0	38.0	79	- 3
Apr	63.2	28.5	45.9	84	6
May	71.7	35.6	53.7	96	12
Jun	80.3	42.7	61.5	104	23
Jul	92.0	49.9	71.0	108	29
Aug	89.7	45.4	67.6	104	28
Sep	80.4	36.8	58.6	103	12
Oct	67.2	28.2	47.7	89	7
Nov	52.3	19.3	35.8	75	- 5
Dec	43.3	16.2	29.8	64	-16
Year	64.8	30.0	47.4	108	-24
Length of record (years)	30	30	30	25	25

Source: Applicant's Environmental Report.

TABLE A-9
MEAN RELATIVE HUMIDITIES
(WINNEMUCCA WEATHER STATION)

Month	Mean relative humidity (percent) Hour of day 0400	1000	1600	2200
Jan	77	66	57	74
Feb	78	60	48	72
Mar	71	48	37	61
Apr	67	39	30	53
May	65	35	27	50
Jun	59	33	24	45
Jul	45	21	14	29
Aug	45	22	15	30
Sep	51	27	19	37
Oct	61	37	28	50
Nov	74	56	46	69
Dec	81	67	60	78
Year	65	43	34	54
Length of Record (years)	25	225	25	25

Source: Applicant's Environmental Report.

APPENDIX C

SOILS, GEOLOGY, AND MINERAL RESOURCES

TABLE C-1
SOIL PHASES AND INTERPRETATIONS
PROJECT SITE AND ES AREA

Great Group	Subgroup	Family	Phases	Engineering Classification		Erosion Hazard	
				Unified	AASHO	Water	Wind
Durargids	Haplic Durargids	clayey-skeletal, montmorillonitic, mesic, shallow	4-15% slopes, stony	GC	A-2 or A-6	Moderately Low	Slight
	Haploxerollic Durargids	fine, montmorillonitic, frigid	4-30% slopes, slightly stony	CL or CH	A-7	Moderately High	Slight
	Xerollic Durargids	fine, montmorillonitic, frigid	2-15% slopes, severely dissected	CL or CH	A-6 or A-7	Moderate	Moderate
			4-15% slopes	CH	A-7	Moderately High	Moderate
		fine, montmorillonitic, mesic	5-15% slopes, extremely stony	SC or CL	A-6 or A-7	Moderate	Slight
		clayey, montmorillonitic, mesic, shallow	0-5% slopes, very stony	CH	A-7	Moderate	Moderate
			5-15% slopes, very stony	CH	A-7	Moderately High	Moderate
	Palexerollic Durargids	clayey, montmorillonitic, mesic, shallow	0-5% slopes, slightly stony	CH or CL	A-6 or A-7	Moderate	Moderate
Haplargids	Typic Haplargids	loamy-skeletal, carbonatic, mesic	2-15% slopes	GC over GP or GM	A-2 over A-1	Moderate	Moderate
		fine loamy, mixed, mesic	0-5% slopes	SM or ML	A-4 or A-5	Moderately Low	Moderate
		fine, montmorillonitic, mesic	0-5% slopes, stony	CH	A-7	Moderate	Slight
		loamy-skeletal, mixed, mesic	4-15% slopes	GC over GP or GM	A-2 over A-1	Moderate	Moderate
			15-30% slopes	GC over GP or GM	A-2 over A-1	Moderately High	Moderate
		loamy, mixed, mesic, shallow	2-15% slopes	SC	A-2 or A-6	Moderately High	Moderate
			15-30% slopes	CL or SC	A-6	Moderately High	Moderate
	Duric Haplargids	loamy-skeletal, mixed, mesic	4-15% slopes	GC or GM over GM or GP	A-2 over A-1	Moderate	Moderate
			4-15% slopes, slightly stony	GM or GC	A-1 or A-2	Moderately Low	Moderate
		fine-loamy, mixed, mesic	15-30% slopes, slightly stony	GC or CL over GP or GM	A-2 or A-6 over A-1	Moderate	Slight
			0-5% slopes, slightly stony	ML or CL	A-4 or A-6	Moderately Low	Moderate
	Durixerollic Haplargids	loamy-skeletal, mixed, frigid	4-15% slopes, slightly stony	GC over GP or GM	A-2 or A-6 over A-1	Moderate	Moderate

TABLE C-1 (continued)

Great Group	Subgroup	Family	Phases	Engineering Classification		Erosion Hazard	
				Unified	AASHO	Water	Wind
		fine, montmorillonitic, mesic	5-15% slopes, slightly stony	CH	A-7	Moderate	Moderate
	Duric Lithic Haplargids	clayey-skeletal, montmorillonitic, mesic	4-30% slopes, slightly stony	GC	A-2 or A-6	Moderate	Slight
	Durixerollic Lithic Haplargids	loamy, mixed, mesic	15-50% slopes, very stony	SM	A-1 or A-2	High	Moderate
		clayey-skeletal, montmorillonitic, mesic	4-30% slopes, slightly stony	GC	A-2 or A-5	Moderate	Slight
			30-70% slopes, slightly stony	GC	A-2 or A-6	Moderate	Slight
	Lithic Haplargids	clayey-skeletal, montmorillonitic, mesic	4-30% slopes, slightly stony	GC	A-2 or A-6	Moderate	Slight
			30-70% slopes, slightly stony	GC	A-2 or A-6	Moderate	Slight
		loamy-skeletal, mixed mesic	30-50% slopes, extremely stony	GM	A-1 or A-2	Moderate	Moderate
	Lithic Ruptic-Entic Haplargids	clayey-skeletal, carbonatic, mesic	15-70% slopes, slightly stony	GC	A-2 or A-6	Moderate	Slight
	Lithic Xerollic Haplargids	loamy-skeletal, mixed frigid	15-50% slopes, slightly stony	GC	A-2 or A-6	Moderately High	Slight
		loamy, mixed, mesic	50-70% slopes, very stony	CL or ML	A-6 or A-7	High	Moderate
		clayey, montmorillonitic, frigid	2-30% slopes, stony	CL or CH	A-7	Moderate	Slight
	Lithic Xerollic Ruptic-Entic Haplargids	clayey-skeletal, carbonatic, frigid	15-50% slopes, slightly stony	GC	A-2 or A-6	Moderate	Slight
	Xerollic Haplargids	fine-loamy, mixed, frigid	4-30% slopes, stony	CL or ML	A-6	Moderate	Slight
		fine, montmorillonitic, frigid	2-15% slopes, severely dissected	CL or CH	A-6 or A-7	Moderate	Moderate
			4-15% slopes	CH	A-7	Moderately High	Moderate
			4-30% slopes, slightly stony	CL or CH	A-7	Moderately High	Slight
			30-50% slopes, very stony	CH or MH	A-7 or A-6	Moderately	Moderate
		fine, montmorillonitic, mesic	30-50% slopes, very stony	GC or CH	A-2, A-6, or A-7	Moderate	Moderate

TABLE C-1 (continued)

Great Group	Subgroup	Family	Phases	Engineering Classification		Erosion Hazard	
				Unified	AASHO	Water	Wind
Nadurargids	Typic Nadurargids	clayey-skeletal, montmoril-lonitic, mesic, shallow	8-15% slopes	GC over GM	A-1 or A-2 over A-1	Moderately High	Moderate
		clayey, montmorillonitic, mesic, shallow	5-15% slopes, very stony	CH	A-7	Moderate	Moderate
		loamy-skeletal, mixed, mesic, shallow	5-15% slopes, extremely stony	GC or GM	A-2	Moderate	Slight
		loamy, mixed, mesic, shallow	5-15% slopes, stony	CL or ML	A-6	Moderate	Moderate
	Haplic Nadrargids	fine, montmorillonitic, mesic	2-15% slopes	CH over GP or GM	A-7 over A-1	Moderately High	Moderate
		(fine-) loamy, mixed, mesic, shallow	2-8% slopes	CL over GP or GM	A-6 over A-1	Moderate	Moderate
		clayey, montmorillonitic, mesic, shallow	2-15% slopes	CH over GP or GM	A-7 over A-1	Moderately High	Moderate
Natrargids	Typic Natrargids	clayey-skeletal, mont-morillonitic, mesic	4-15% slopes	GC GC over GP	A-2 or A-6 A-2 or A-6	Moderate	Moderate
			15-30% slopes	or GM	over A-1	Moderate	Moderate
		coarse-loamy, mixed mesic	2-4% slopes	SM or SC	A-2	Moderately low	Severe
			4-8% slopes	SM or SC over SM	A-2 over A-2 or A-1	Moderate	Severe
		fine-loamy over sandy or sandy-skeletal, mixed mesic	0-15% slopes, saline	SC over GP or GP - GM	A-2 or A-6 over A-1	Moderate	Severe
		fine-loamy, mixed mesic	0-2% slopes	SC over SM	A-6 over A-2 or A-4	Moderately low	Severe
			0-2% slopes, occasionally flooded	SC over SM	A-6 over A-2 or A-4	Moderately low	Severe
			0-2% slopes, saline, occasionally flooded	CL over ML	A-4	Moderately low	Severe
			0-4% slopes, saline, gravel substrata	CL and SM over GP or GM	A-6 and A-2 over A-1	Moderately low	Severe
			2-4% slopes	SC or CL over SM	A-6 or A-7 over A-2	Moderate	Severe

TABLE C-1 (continued)

Great Group	Subgroup	Family	Phases	Engineering Classification		Erosion Hazard	
				Unified	AASHO	Water	Wind
			2-4% slopes, saline	SC or CL over SM	A-6 or A-7 over A-2	Moderate	Severe
			4-15% slopes	SC over SM	A-6 over A-1 or A-2	Moderate	Severe
		fine-silty, mixed mesic, mesic	0-2% slopes, saline, occasionally flooded	ML or CL	A-4 or A-6	Moderately Low	Moderate
		clayey, montmorillonitic mesic, shallow fine, montmorillonitic, mesic	4-15% slopes	CL or CH	A-6 or A-7	Moderately High	Slight
			0-2% slopes, occasionally flooded	CH or SM	A-7 over A-1 or A-2	Moderate	Moderate
			0-2% slopes, saline, occasionally flooded	CL or CH	A-7	Moderately Low	Slight
			2-4% slopes, saline	CL or CH over SM or SC	A-7 over A-2 or A-6	Moderate	Moderate
			2-8% slopes	CH over CL	A-7	Moderately High	Moderate
			4-15% slopes, shallow gravel substratum	CH over GP or GM	A-7 over A-1	Moderate	Moderate
			8-30% slopes	CL or CH over GP	A-6 or A-7 over A-1	Moderate	Slight or Moderate
			30-50% slopes	CL or CH over GM or GC	A-6 or A-7 over A-1 or A-2	Moderately High	Moderate
	Duric Natrargids	loamy-skeletal, mixed, mesic	8-50% slopes, eroded	SC or CL over GP or GM	A-6 over A-1	Moderately High	Slight
		fine-loamy, mixed, mesic	0-4% slopes	SC or CL over SM	A-6 or A-7 over A-2	Moderate	Severe
			4-30% slopes, shallow gravel substram	CL over GP or GM	A-6 or A-7 over A-1	Moderately High	Moderate
			30-50% slopes	CL or CH over GM or GC	A-4 or A-6 over A-1 or A-2	Moderately High	Moderate
		clayey over sandy or sandy-skeletal, mont-morillonitic, mesic	4-8% slopes	SC over SM	A-6 over A-1 or A-2	Moderate	Moderate

TABLE C-1 (continued)

Great Group	Subgroup	Family	Phases	Engineering Classification		Erosion Hazard	
				Unified	AASHO	Water	Wind
		fine, montmorillonitic, mesic	2-4% slopes, saline, shallow gravel substratum	CH over GP or GM	A-7 over A-1	Moderate	Moderate
			2-8% slopes, shallow gravel substratum	CH or GP over GM	A-7 over A-1	Moderately High	Moderate
			4-8% slopes, shallow gravel substratum, severely dissected	CL or CH over GP or GM	A-6 or A-7 over A-1	Moderate	Moderate
			2-15% slopes, gravel substratum	CH over GP or GM	A-7 over A-1	Moderately High	Moderate
	Lithic Natrargids	loamy-skeletal, mixed, mesic	15-30% slopes, very stony	GM	A-2	High	Moderate
Calcicrthids	Xerollic Calciorthids	loamy-skeletal, carbonatic, frigid	30-70% slopes, slightly stony	GC	A-2 over A-6	Moderate	Slight
Camborthids	Typic Camborthids	loamy-skeletal, mixed, mesic	4-15% slopes	GM over GP or GM	A-2 over A-1	Moderate	Moderate
			15-30% slopes	GM over GP or GM	A-1	Moderately High	Moderate
		loamy, mixed, mesic, coarse-loamy, mixed, mesic	15-30% slopes	SM	A-2	Moderately High	Moderate
			0-4% slopes	SM	A-2	Moderately Low	Severe
			4-8% slopes	SM	A-2 over A-1	Moderately Low	Moderate
			8-15% slopes	SM	A-2 or A-4	Moderately Low	Moderate or Severe
			15-30% slopes	SM	A-2	Moderate	Moderate or Severe
	Duric Camborthids	loamy-skeletal, mixed, mesic coarse-loamy, mixed, mesic	4-15% slopes	GM over GP or GM	A-2 over A-1	Moderate	Moderate
			0-2% slopes	SM over GP GM or GM	A-2 or A-4 over A-1	Low	Severe
			2-4% slopes	SM	A-2	Moderately Low	Severe
			4-15% slopes	SC over SM	S-2	Moderately Low	Severe
			8-30% slopes, slightly stony	SM over SM or GM	A-2 over A-1	Moderate	Moderate

TABLE C-1 (continued)

Great Group	Subgroup	Family	Phases	Engineering Classification		Erosion Hazard	
				Unified	AASHO	Water	Wind
	Durixerollic Camborthids	fine-loamy, mixed, mesic	0-5% slopes, slightly stony	ML or CL	A-6	Moderately Low	Moderate
	Xerollic Camborthids	loamy-skeletal, mixed, frigid	4-15% slopes	GM or GC over over GP or GM	A-2 or A-6 over A-1	Moderately Low	Slight
			50-70% slopes, very stony	GM	A-2	Moderate	Moderate
	Lithic Xerollic Camborthids	loamy-skeletal, mixed, frigid	50-70% slopes, very stony	GM	A-2	High	Moderate
Durothids	Typic Durothids	loamy-skeletal, mixed, mesic	15-30% slopes, very stony	GM	A-2	High	Slight
		loamy-skeletal mixed, shallow	30-70% slopes, extremely stony	GM	A-2	Moderately High	Slight
Salorthids	Typic Salorthids	fine-silty, mixed, mesic	0-2% slopes, occasionally flooded	CL	A-7	Moderately Low	Slight
		fine, montromorillonitic, mesic	0-2% slopes, occasionally flooded	CH	A-7	Moderately Low	Slight
Torriorthents	Typic Torriorthents	loamy-skeletal, carbonatic, mesic	2-15% slopes	GM over GP or GM	A-1	Moderately Low	Moderate
			30-70% slopes, slightly stony	GM	A-1 or A-2	Moderately Low	Slight
		loamy, mixed, nonacid, mesic shallow	4-30% slopes	SM	A-1 or A-2	High	Moderate
			30-70% slopes	SM	A-1 or A-2	High	Moderate
		loamy, mixed (calcareous), mesic, shallow	4-30% slopes	SC or CL	A-2 or A-6	Moderately High	Slight
		coarse-loamy, mixed (calcareous), mesic	0-2% slopes, occasionally flooded	SM	A-2 or A-4	Low	Severe
		fine-silty, mixed (calcareous), mesic	0-2% slopes, occasionally flooded	CL or ML	A-4 or A-6	Moderately Low	Moderate
			0-2% slopes, saline, occasionally flooded	ML or CL	A-4 or A-6	Moderately Low	Moderate
		loamy-skeletal, mixed, non-acid, mesic	0-5% slopes, stony	SM over GM	A-4 or A-2 over A-2	Moderate	Moderate

TABLE C-1 (continued)

Great Group	Subgroup	Family	Phases	Engineering Classification		Erosion Hazard	
				Unified	AASHO	Water	Wind
	Aquic Torriorthents	coarse-loamy, mixed (calareous), mesic	0-2% slopes, saline	SM or ML	A-4	Moderately Low	Severe
		fine-silty, mixed (calcareous), mesic	0-2% slopes, saline	CL	A-7	Moderate	Moderate
	Lithic Torriorthents	loamy-skeletal, mixed (calcareous), mesic	8-70% slopes, very shallow, slightly stony	GM	A-2 or A-4	Moderate	Slight
		loamy, mixed (calcareous), mesic	4-50% slopes, very shallow	SC, ML or CL	A-4 or A-6	High	Slight
	Xeric Torriorthents	loamy, mixed, non-acid, frigid, shallow	15-70% slopes	SM	A-1 or A-2	High	Moderate
		coarse-loamy, mixed, non-acid, mesic	0-2% slopes, occasionally flooded	SM	A-2	Low	Severe
Xerortherts	Typic Xerorthents	coarse-loamy, mixed, non-acid, mesic	0-5% slopes	SM or ML	A-2 or A-4	Moderate	Moderate
		loamy-skeletal, mixed, non-acid, frigid, shallow	50-70% slopes, extremely stony	GM or SM	A-2 or A-1	Moderate	Moderate
	Aquic Xerorthents	coarse-loamy, mixed calcareous, mesic	0-5% slopes	SM or ML	A-2 or A-4	Low	Severe
	Lithic Xerorthents	loamy, mixed, non-acid, mesic	50-70% slopes, very stony	SM or GM	A-2 or A-1	Moderately High	Slight
		loamy-skeletal, mixed, non-acid, frigid	50-70% slopes, very steny	SM or GM	A-2 or A-1	Moderately High	Slight
Torripsamments	Typic Torripsamments	mixed mesic	2-4% slopes	SM	A-2 or A-1	Moderately Low	Severe
			4-15% slopes	SP or SP-SM	A-3	Low	Severe
			15-50% slopes	SP	A-3	Moderately Low	Severe
	Durorthidic Torripsamments	mixed, mesic	0-5% slopes	SP	A-3	Slight	Severe
Xeropsamments	Typic Xeropsamments	mixed, frigid	5-15% slopes, stony	SP	A-3	Moderately High	Severe
		mixed, frigid, shallow	30-70% slopes, very stony	SP	A-3	Moderately High	Severe

TABLE C-1 (continued)

Great Group	Subgroup	Family	Phases	Engineering Classification		Erosion Hazard	
				Unified	AASHO	Water	Wind
Psammaquents	Typic Psammaquents	mixed, mesic	0-5% slopes	SP	A-3	Low	Severe
Xerofluvents	Typic Xerofluvents	coarse-loamy, mixed, non-acid, mesic	0-5% slopes	ML or SM	A-2 or A-4	Moderate	Moderate
	Aquic Xerofluvents	coarse-loamy, mixed, non-acid, mesic	0-5% slopes	ML or SM	A-2 or A-4	Moderate	Moderate
		sandy, mixed, mesic	0-5% slopes	SP	A-3	Moderately Low	Severe
Haplaquolls	Typic Haplaquolls	coarse-loamy over sandy, mixed (calcareous), mesic	0-5% slopes, drained	SM over SP	A-2 or A-4 over A-3	Moderately Low	Severe
	Fluvaquentic Haplaquolls	sandy, mixed, mesic	0-5% slopes	SM or CL over SP	A-2 or A-4 over A-3	Slight	Moderate
		fine-loamy, mixed, non-calcareous, mesic	0-5% slopes	CH or CL	A-7 or A-6	Slight	Moderate
		fine, montmorillonitic, non-calcareous, mesic	0-5% slopes	CH	A-7	Slight	Slight
	Vertic Haplaquolls	very fine, montmorillonitic, non-calcareous, mesic	0-5% slopes	CH	A-7	Slight	Slight
Cryoborolls	Argic Lithic Cryoborolls	clayey-skeletal, mont-morillonitic	30-70% slopes, slightly stony	GC	A-2 or A-6	Moderate	Slight
	Pachic Cryoborolls	fine-loamy, mixed	15-50% slopes	ML	A-4	Moderately High	
Argixerolls	Aridic Argixerolls	fine, montmorillonitic frigid	30-50% slopes, stony	CH	A-7	Moderately High	Slight
	Lithic Argixerolls	clayey-skeletal, carbonatic frigid	30-70% slopes, slightly stony	GC	A-2 or A-6	Moderate	Slight
		clayey-skeletal, mont-morillonitic, frigid	15-70% slopes, slightly stony	GC	A-2 or A-6	Moderate	Slight

TABLE C-1 (continued)

Great Group	Subgroup	Family	Phases	Engineering Classification		Erosion Hazard	
				Unified	AASHO	Water	Wind
Haploxerolls	Ultic Haploxerolls	coarse-loamy, mixed, frigid	30-70% slopes	SM	A-1 or A-2	Moderately High	Moderate
	Entic Ultic Haploxerolls	sandy, mixed, frigid	30-50% slopes, slightly rocky	SP	A-3	Moderate	Severe
	Aridic Pachic Haploxerolls	fine-loamy, mixed, frigid	30-50% slopes, slightly rocky	ML or CL	A-4 or A-6	Moderate	Moderate
	Aquic Fluventic Haploxerolls	fine-loamy over sandy, or sandy-skeletal, mixed, mesic	0-5% slopes	ML or CL over SP	A-4 or A-6 over A-3	Slight	Slight
		fine-loamy, mixed, mesic	0-5% slopes	CH or ML	A-7 or A-6	Slight	Moderate
Chromoxererts	Typic Chromoxererts	very fine, montmorillonitic, mesic	0-5% slopes	CH	A-7	Slight	Slight
		very fine, montmorillonitic, frigid	5-15% slopes, extremely stony	CH	A-7	Moderate	Slight
	Aquic Chromoxererts	fine, montmorillonitic, mesic	0-5% slopes, saline	CH	A-7	Moderate	Slight

TABLE C-2
SOME CHARACTERISTICS OF THE SOIL SUBGROUPS IN THE ES AREA

SUBGROUPS	LANDFORMS	TYPICAL VEGETATION	MEAN ANNUAL PRECIPITATION (cm.)
Haplic Durargids	dissected alluvial fans, pediment remnants	black sagebrush, pinyon, Utah juniper	25-50
Haploxerollic Durargids	hill slopes	big sagebrush, grass	25-50
Xerollic Durargids	dissected alluvial fans	big sagebrush, grass, Utah juniper	25-50
Palexerolllic Durargids	alluvial fans	low sagebrush, shadscale	12-37
Typic Haplargids	ballenas, dissected alluvial fans	shadscale, bud sagebrush, Bailey greasewood	12-37
Duric Haplargids	dissected alluvial fans	shadscale, Bailey greasewood, bud sagebrush	12-37
Durixerollic Haplargids	dissected alluvial fans	big sagebrush, grass	12-37
Duric Lithic Haplargids	hill slopes	shadscale, bud sagebrush	12-25
Durixerollic Lithic Haplargids	hill slopes	shadscale, bud sagebrush	12-37
Lithic Haplargids	hill slopes	shadscale, bud sagebrush, Bailey greasewood	12-25
Lithic Ruptic-Entic Haplargids	mountain summit and convex sideslopes	shadscale, grass, Mormon tea	25-37
Xerollic Haplargids	dissected alluvial fans, mountain summit slopes, ballenas	big sagebrush, grass, Utah juniper, lupine	25-50
Typic Nadurargids	dissected alluvial fans	shadscale, bud sagebrush	12-25
Haplic Nadurargids	hill summit slopes, alluvial fans, pediment remnants	Bailey greasewood, bud sagebrush, spring hopsage	12-25
Typic Natrargids	dissected alluvial fans, floodplains and stream terraces	Bailey greasewood, bud sagebrush, black greasewood, shadscale, four wing saltbrush	12-37
Playas	basin-fill plains	none	12-25
Rubbleland	dissected alluvial fans, mountain ridges and crests	--	--
Rock Outcrop	mountain slopes		
Duric Natrargids	alluvial fan remnants and basin rims	winterfat, grass, Bailey greaswood, shadscale, budsage	12-37
Lithic Natrargids	hill slopes	shadscale, Bailey greasewood	12-25
Xerollic Calciorthids	mountain sideslopes and footslopes	Utah juniper, sagebrush, phlox, showberry	25-50
Typic Camborthids	alluvial fans	Bailey greasewood, shadscale, horsebrush, Mormon tea, budsage	12-37
Duric Camborthids	basin-fill plains, alluival fan footslopes	winterfat, grass, budsage, Bailey greasewood, shadscale	12-37
Durixerollic Camborthids	alluvial fans	big sagebrush, shadscale, bud sagebrush	12-37
Xerollic Camborthids	dissected alluvial fans	big sagebrush, grass	12-37
Lithic Xerollic Camborthids	mountain sideslopes	big sagebrush, juniper	12-37
Typic Durorthids	alluvial fans	shadscale, spring hopsage, rabbitbrush	12-25
Typic Salorthids	basin-fill plains	saltgrass, black greasewood, iodine bush, saltbush	12-25
Typic Torriorthents	alluvial fan, toeslopes, off-shore bars and beaches, basin fill plains	rabbit brush, Indian rigegrass, Bailey greasewood	12-25
Aquic Torriorthents	basin-fill plains	saltgrass, shadscale, black greasewood, shadscale	12-25
Lithic Torriorthents	eroded hill slopes	shadscale	12-25
Xeric Torriorthents	stream floodplains	big sagebrush	12-25
Typic Xerorthents	floodplains	cropland	12-37
Aquic Xerorthents	floodplains	native meadow	12-37
Lithic Xerorthents			
Typic Torripsamments	sand dunes, alluvial fans	black greasewood, shadscale, Indian ricegrass, dalea, winterfat	12-25
Durorthidic Torripsamments	alluvial fans	big sagebrush	12-25
Typic Xeropsamments	mountain sideslopes	big sagebrush, manzanita	12-37
Typic Psammaquents	floodplains	cropland	12-25
Typic Xerofluvents	floodplains	big sagebrush, cropland	12-25
Aquic Xerofluvents	floodplains	willows	12-25
Typic Haplaquolls	floodplains	cropland or urban	12-25
Fluraquentic Haplaquolls	floodplains	black greasewood, sedges, saltgrass, pasture	12-25
Vertic Haplaquolls	floodplains	greasewood, saltgrass	12-25
Argic Lithic Cryoborolls	mountain sideslopes	low sagebrush, grass, phlox	25-37
Pachic Cryoborolls	mountain sideslopes and footslopes	big sagebrush, lupine	25-37
Aridic Argixerolls	mountain sideslopes	big sagebrush, manzanita, mountain mahogany, pinyon pine	25-75
Lithic Argixerolls	mountain summit and sideslopes	big sagebrush, Utah juniper, grass, phlox	25-50
Ultic Haploxerolls	mountain sideslopes and footslopes	pinyon pine, big sagebrush, grass	25-50
Entic Ultic Haploxerolls	mountain slopes	big sagebrush	12-37
Aridic Pachic Haploxerolls	mountain slopes	big sagebrush, Jeffrey pine, Sierra juniper, manzanita	25-75
Aquic Fluventic Haploxerolls	stream terraces	big sagebrush, grasses, pasture, cropland	12-25
Typic Chromoxererts	mountain sideslopes	big sagebrush	12-25
Aquic Chromoxererts	basins	black greasewood, iodine bush	12-25
Lithic Xerollic Haplargids	mountains summit slopes	low sagebrush, grass	20-37
Lithic Xerollic Ruptic-Entic Haplargids	mountain summit and convex sideslopes	shadscale, grass, Mormon tea	12-25

TABLE C-3
TRACE ELEMENT CONCENTRATION IN VALMY,
UNITED STATES AND WORLD SOILS.

Element	Mean (ppm) Valmy	United States	World	Range
Arsenic (As)	8.9	5	6	0.1 to 40
Boron (B)	40	38	10	2 to 100
Barium (Ba)	2,300	5	500	
Calcium (Ca)	> 10,000	25,000	13,700	7,000 to 500,000
Cobalt (Co)	6.6	10	8	1 to 40
Chromium (Cr)	10	52	100	--
Copper (Cu)	24	25	20	2 to 100
Germanium (Ge)	<10	270	1	1 to 50
Manganese (Mn)	300	600	850	100 to 4,000
Nickel (Ni)	20	20	40	10 to 1,000
Lead (Pb)	28	20	10	2 to 200
Selenium (Se)	< 0.5	--	0.2	0.01 to 2
Strontium (Sr)	260	10	300	50 to 1,000
Titanium (Ti)	>10,000	3,000	5,000	1,000 to 10,000
Vanadium (V)	50	78	100	20 to 500

Source: Applicant's Environmental Report.

TABLE C-4
STRATIGRAPHY OF A TYPICAL SECTION AT THE NORTH VALMY SITE

Elevation, Meters (Feet)		Thickness Average	Thickness Range	Description
	Silt	1.2 m 4.0 ft	0.6 - 2.4 m 2.0 - 8.0 ft	Typical surficial deposit. It is non to slightly plastic, calcareous and ranges in density from loose to dense with occasional very hard cemented zones. A few small areas consist of loose fine sand and silty sand.
1355.8 m 4450.0 ft				
	Unit 1	3.5 m 11.4 ft	2.4 - 5.2 m 8.0 -17.0 ft	Consists mostly of very dense poorly graded gravelly sand. It contains fine to coarse sand, subangular to sell rounded gravel to 76.2 mm (3-inch) max. and 0 to 10% non to very slightly plastic fines. The remainder is composed of very dense fine sand and silty sand with 2 to 15% non to very slightly plastic fines.
1352.7 m 4440.0 ft				
	Unit 2	4.0 m 13.0 ft	2.4 - 4.9 m 8.0 -16.0 ft 1	Highly stratified deposit of compressible and noncompressible soils. The compressible portion is composed of overconsolidated, calcareous, sometimes cemented and highly plastic sandy clays and clays and a much lesser amount of plastic silts. These range from stiff to hard in consistency, are uniformly distributed and total up to 60% of Unit 2 in some areas. The noncompressible portions consist of fine sand and calcareous, sometimes cemented, nonplastic, silty sand, sandy silt and silt. These range in density from compact to very dense.
1349.7 m 4430.0 ft				
	Unit 3	1.4 m 4.5 ft	1.1 - 1.5 m 3.5 - 5.0 ft	Consists of highly calcareous, sometimes cemented, fissured, highly plastic light green clay. It is overconsolidated and contains occasional thin layers of non to slightly plastic silt of similar color and highly calcareous white cemented material.
1346.6 m 4420.0 ft				
	Unit 4	6.9 m 22.5 ft	5.8 - 7.9 m 19.0 -26.0 ft	Highly stratified and similar to Unit 2 in soil types. The top 0.9 to 1.8 m (3 to 6 ft) is generally very dense noncompressible soil. The next 1.8 to 2.7 m (6 to 9 ft) contains up to 50% uniformly distributed compressible soil ranging from very stiff to extremely hard. The bottom 3.0 m (10 ft) may contain up to 100% compressible soils, ranging from stiff to hard.
1343.6 m 4410.0 ft				
1340.5 m 4400.0 ft				
	Bed-rock			Basalt, dark gray to reddish brown, moderately to closely jointed, hard to very hard, fine to very fine grained, vesicular with some vesicles partially or completely filled with calcite.
1337.5 m 4390.0 ft				

Source: Applicant's Environmental Report.

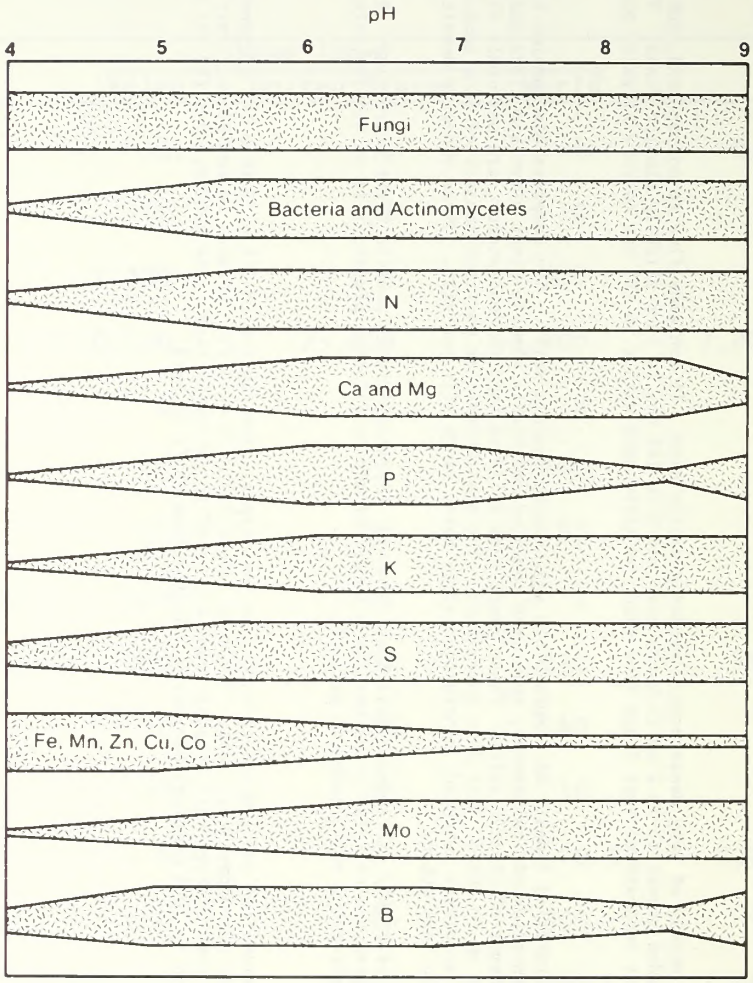


FIGURE C-1 — RELATIONSHIP EXISTING IN MINERAL SOILS

FIGURE C-1

Relationships existing in mineral soils between pH on the one hand and the activity of microorganisms and the availability of plant nutrients on the other. The wide portions of the bands indicate the zones of greatest microbial activity and the most ready availability of nutrients. Considering the correlations as a whole, a pH range of approximately 6 to 7 seems to promote the most ready availability of plant nutrients. In short, if soil pH is suitably adjusted for phosphorus, other plant nutrients, if present in adequate amounts, will be satisfactorily available in most cases.

MAP AREA

NEVADA

10 MILLION TO 100 MILLION
1 MILLION TO 10 MILLION
LESS THAN 1 MILLION

NOTE: PRODUCTION IN DOLLARS

Oreana Substation

NORTH VALMY PLANT SITE

AUSTIN SUBSTATION

MIRA LOMA SWITCHING STATION

Tracy Station

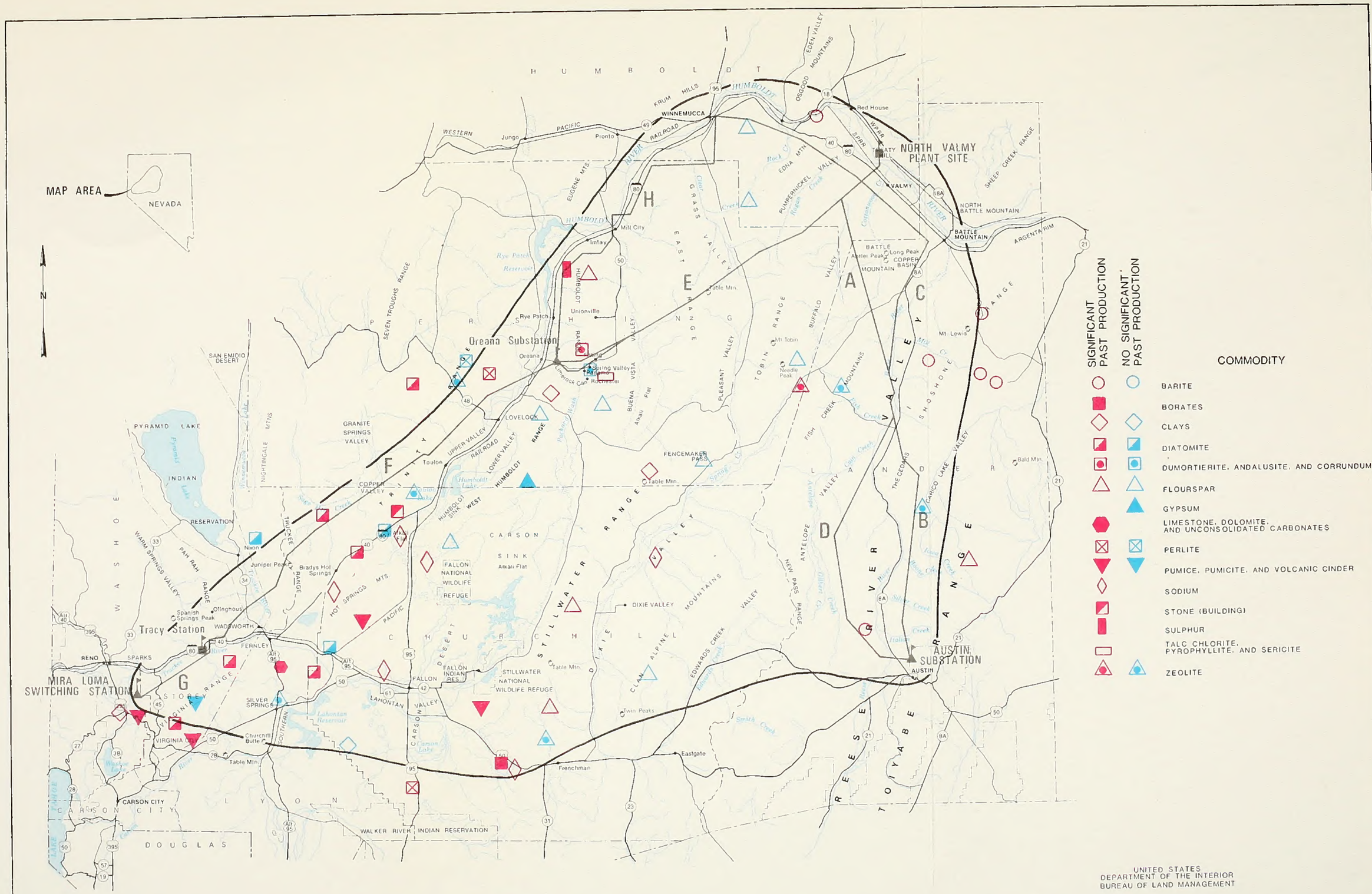
10 0 10 20 30 40
MILES
10 0 10 20 30 40 50
KILOMETERS

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

NORTH VALMY POWER PROJECT

METAL MINING DISTRICTS

1977


MAP AREA
NEVADA
N
HUMBOLDT
WINNEMUCCA
Red House
NORTH VALMY PLANT SITE
VALMY
Oreana Substation
Tracy Station
MIRA LOMA SWITCHING STATION
AUSTIN SUBSTATION
AUSTIN
RENO
SPARKS
CARSON CITY
DOUGLAS
LYON
CHURCHILL
PERSHING
STOREY
WASHOE
LANDER
EUREKA
NYE
MINERAL
LINCOLN
WHITE PINE
PYRAMID LAKE
WALKER RIVER INDIAN RESERVATION
FALLON NATIONAL WILDLIFE REFUGE
STILLWATER NATIONAL WILDLIFE REFUGE
FALLON INDIAN RES.
CARSON SINK
Alkali Flat
Table Mtn.
Mt. Tobin
Mt. Lewis
Needle Peak
Bald Mtn.
Twin Peaks
Frenchman
Eastgate
Fencemaker Pass
Toulon
Lovelock
Unionville
Imlay
Mill City
Jungo
Pronto
Nixon
Fernley
Fallon
Hot Springs Mts.
Seven Troughs Range
Eugene Mts.
Krum Hills
Osgood Mountains
Eden Valley
Sheep Creek Range
Edna Mtn.
Pumpernickel Valley
North Battle Mountain
Battle Mountain
Argenta Rim
Copper Basin
Battle Mountain
Antler Peak
Long Peak
Buffalo Valley
Fish Creek Mountains
Pleasant Valley
Tobin Range
Buena Vista Valley
Granite Springs Valley
San Emidio Desert
Nightingale Mtns
Warm Springs Valley
Pah Rah Range
Virginia Range
Stillwater Range
Clan Alpine Mountains
Dixie Valley
Edwards Creek Valley
New Pass Range
Antelope Valley
Cortez Mountains
Toiyabe Range
Reese River Valley
Cedars
Carico Lake Valley
Shoshone Range
Humboldt River
Rye Patch Reservoir
Lahontan Reservoir
Lahontan Valley
Carson Desert
Pyramid Lake
Indian Lakes
Humboldt Lake
Carson Lake
Walker Lake
Rye Patch
Oreana
Spring Valley
Rochester
Lovelock Cave
Humboldt House
Alkali Flat
Humboldt Sink West
Upper Valley
Lower Valley
Humboldt Range
Trinity Range
Truckee River
Western Pacific Railroad
Southern Pacific Railroad
Humboldt River
Reservation
Juniper Peak
Bradys Hot Springs
Spanish Springs Peak
Offinghouse
Wadsworth
Churchill Butte
Table Mtn.
Silver Springs
Virginia City
Carson City
Stillwater
Salt Wells
Hazen
Fallon
Lahontan
Dixie
Clan Alpine
Edwards Creek
Reese River
Toiyabe
Austin
Eastgate
Frenchman
Twin Peaks
Smith Creek
Dixie Valley
Table Mtn.
Fencemaker Pass
Toulon
Lovelock
Unionville
Imlay
Mill City
Jungo
Pronto
Nixon
Fernley
Fallon
Hot Springs Mts.
Seven Troughs Range
Eugene Mts.
Krum Hills
Osgood Mountains
Eden Valley
Sheep Creek Range
Edna Mtn.
Pumpernickel Valley
North Battle Mountain
Battle Mountain
Argenta Rim
Copper Basin
Battle Mountain
Antler Peak
Long Peak
Buffalo Valley
Fish Creek Mountains
Pleasant Valley
Tobin Range
Buena Vista Valley
Granite Springs Valley
San Emidio Desert
Nightingale Mtns
Warm Springs Valley
Pah Rah Range
Virginia Range
Stillwater Range
Clan Alpine Mountains
Dixie Valley
Edwards Creek Valley
New Pass Range
Antelope Valley
Cortez Mountains
Toiyabe Range
Reese River Valley
Cedars
Carico Lake Valley
Shoshone Range
Humboldt River
Rye Patch Reservoir
Lahontan Reservoir
Lahontan Valley
Carson Desert
Pyramid Lake
Indian Lakes
Humboldt Lake
Carson Lake
Walker Lake
Rye Patch
Oreana
Spring Valley
Rochester
Lovelock Cave
Humboldt House
Alkali Flat
Humboldt Sink West
Upper Valley
Lower Valley
Humboldt Range
Trinity Range
Truckee River
Western Pacific Railroad
Southern Pacific Railroad

APPENDIX D

WATER RESOURCES AND WATER QUALITY

TABLE D-1 a/
QUALITY STANDARDS FOR CLASS C WATERS

Standards	Specifications
1. Floating solids; settleable solids; sludge deposits.	Only such amounts attributable to the activities of man which will not make the receiving waters injurious to fish or impair the waters for any beneficial use established for this class.
2. Sewage, industrial wastes, or other wastes.	None which are not effectively treated to the satisfaction of the Department.
3. Toxic materials; oils; deleterious substances; colored or other wastes; or heated or cooled liquids.	Only such amounts as will not render the receiving waters injurious to fish and wildlife or impair the waters for any beneficial use established for this class.
4. pH.	Range between 6.5 to 8.5.
5. Dissolved oxygen.	For trout waters not less than 6.0 mg/l; for nontrout waters not less than 5.0 mg/l.
6. Temperature.	Shall not exceed 20°C for trout waters or 34°C for nontrout waters. Allowable temperature increase above normal receiving water temperature -3°C.
7. Fecal coliform.	The more stringent of the following apply: The fecal coliform concentration shall not exceed a geometric mean of 1,000 per 100 milliliters nor shall more than 20 percent of total samples exceed 2,400 per 100 milliliters. The annual geometric mean of fecal coliform concentration shall not exceed that characteristic of natural conditions by more than 200 per 100 milliliters nor shall the number of fecal coliform in a single sample exceed that characteristic of natural conditions by more than 400 per 100 milliliters. The fecal coliform concentration, based on a minimum of five samples during any 3-day period, shall not exceed a geometric mean of 200 per 100 milliliters, nor shall more than 10 percent of total samples during any 30-day period exceed 400 per 100 milliliters. This is applicable only to those waters used for primary contact recreation.
8. Total phosphates.	Total phosphates shall not exceed 1.0 mg/l.
9. Total dissolved solids.	Shall not exceed 500 mg/l or one-third above that characteristic of natural conditions (whichever is less).

a/ Class C Waters: This classification includes waters or portions thereof which are located in areas of moderate to urban human habitation, industrial developments present in moderate amounts, intensive agricultural practices and the watershed considerably altered by man's activity. Beneficial uses: Domestic water supply following complete treatment, agricultural use, aquatic life, wildlife propagation, recreation, esthetics, and industrial supply.

Source: State of Nevada, Department of Human Resources. Water Pollution Control Regulations.

TABLE D-2
WATER QUALITY OF THE HUMBOLDT RIVER AT
BATTLE MOUNTAIN AND COMUS, NEVADA

Year and date	Element (parts per million)					
	Lead	Mercury	Copper	Zinc	Cadmium	Chromium
Battle Mountain						
1975						
June 5	≤0.01	≤0.003	0.00	0.02	≤0,002	≤0.02
July 22	≤ .01	≤ .004	.02	.03	≤ .002	≤ .02
Aug 12	≤ .01	≤ .0004	.01	.01	≤ .002	≤ .02
Aug 26	≤ .01	≤ .0004	.03	0.00	≤ .002	≤ .02
Sep 9	≤ .01	≤ .0004	.01	.01	≤ .002	≤ .02
Sep 30	≤ .01	≤ .0004	.03	.01	≤ .002	≤ .02
Oct 21	≤ .01	≤ .0004	.01	.01	≤ .002	≤ .02
Nov 18	≤ .01	≤ .0004	.01	.01	≤ .002	≤ .02
Dec 15	≤ .01	≤ .0004	0.00	0.00	≤ .002	≤ .01
1976						
May 18	≤0.005	≤0.0004	0.01	0.00	≤0.001	≤0.005
June 29	≤ .005	≤ .0004	0.00	.01	≤ .002	≤ .005
Nov 12	≤ .005	≤ .0004	0.00	0.00	≤ .001	≤ .002
Comus						
1975						
June 24	≤0.01	≤0.0003	0.00	0.00	≤0.002	≤0.02
July 22	≤ .01	≤ .0004	.01	.02	≤ .002	≤ .02
Aug 12	≤ .01	≤ .0004	.01	.01	≤ .002	≤ .02
Aug 26	≤ .01	≤ .0004	.01	0.00	≤ .002	≤ .02
Sep 9	≤ .01	≤ .0004	.01	.01	≤ .002	≤ .02
Oct 21	≤ .01	≤ .0004	.01	0.00	≤ .002	≤ .02
Nov 18	≤ .01	≤ .0004	.01	.01	≤ .002	≤ .02
Dec 16	≤ .01	≤ .0005	.02	0.00	≤ .002	≤ .01
1976						
May 18	≤0.005	≤0.0005	0.01	0.00	<0.001	≤0.005
June 29	≤ .005	≤ .0004	.01	.02	< .002	≤ .005
Nov 2	≤ .005	≤ .0004	0.00	0.00	< .001	≤ .002

Source: State of Nevada, Department of Human Resources, memorandum, February 7, 1977.

TABLE D-3
SURFACE WATER QUALITY OF HUMBOLDT RIVER AT BATTLE MOUNTAIN AND WINNEMUCCA[a/]

Constituent	Battle Mountain		Winnemucca	
	9/2/64	11/5/64	9/3/64	11/4/64
Flow, cfs	12.7	29.7	--	--
pH, pH units	8.0	8.2	8.2	8.3
Silica	34	32	41	35
Iron	0.03	0.08	0.02	0.02
Calcium	43	48	50	80
Magnesium	21	17	21	23
Sodium	68	58	108	135
Potassium	8.4	8.4	4.6	9.2
Bicarbonate	263	281	353	368
Carbonate	0	0	0	6
Hardness, Ca, Mg	193	191	213	240
Chloride	40	38	59	80
Fluoride	0.9	0.8	1.1	1.1
Sulfate	74	63	76	108
Nitrate	3.0	0.7	3.1	0.4
Boron	0.3	0.3	0.5	0.6
TDS	435	414	556	637
Specific conductance, micromho/cm	680	684	878	1,110

a/ Data given in ppm or as indicated.

State Regulations

TDS 500 ppm or 1/3 above natural (whichever is less)
pH 6.5 to 8.5
Dissolved oxygen, trout 6.0 ppm; nontrout 5.0 ppm
Temperature, trout 20°C; nontrout 34°C; 3.0°C ΔT
Phosphate 1 ppm

Source: Applicant's Environmental Report.

TABLE D-4
CHEMICAL ANALYSES OF WATER FROM TEST HOLES
(RESULTS EXPRESSED IN MILLIGRAMS PER LITER EXCEPT SPECIFIC CONDUCTANCE, pH, AND TEMPERATURE)

	Test hole or production well number					
	PW 1	PW 3	PW 4	PW 5	Supply well for PW 5[a]	PW 5
Date sampled	7/17/76	9/22/76	11/30/76	1/11/77	1/11/77	2/16/77
Total iron (Fe)	0.07	1.52	0.08	0.76	--	--
Dissolved iron (Fe)	0.04	0.13	0.08	0.02	--	--
Calcium (Ca)	11.25	19.9	102.5	19.5	42.2	60
Magnesium (Mg)	3.61	1.49	23.56	3.67	10.2	9.7
Sodium (Na)	72.0	33.8	59.5	63.6	32.2	63
Potassium (K)	1.52	5.09	2.39	3.85	2.45	3.87
Carbonate (CO_3)	--	--	--	--	--	--
Bicarbonate (HCO_3)	141.4	97.5	148	118.4	132.4	168
Sulfate (SO_4)	36.2	38	208	70	64	133
Chloride (Cl)	38.6	12.5	104	30	31	63
Nitrate (NO_3)	0.26	2.12	3.1	0.35	0.80	--
Total phosphate (P)	0.27	0.12	0.03	0.02	--	--
Aluminum (Al)	0.02	0.17	0.02	0.01	--	--
Dissolved carbon dioxide (CO_2)	10.7	3	10.2	7	--	--
Silica (SiO_2)	24.5	63	24.2	22	28	23
Manganese (Mn)	0.005	<0.005	0.007	--	--	--
Fluoride (F)	0.37	0.58	0.33	0.46	0.26	--
Arsenic (As)	0.025	0.017	0.007	--	--	--
Sulfide (S)	<0.01	<0.01	<0.01	<0.01	--	--
Dissolved solids at 180° C	261	241±2	631	283	284	432
Total hardness as $CaCO_3$	48	51	345	64.2	--	188
Specific conductance (micromhos/cm at 25° C)	410	290	997	445	435	685
Laboratory pH	7.96	8.35	7.58	7.97	7.67	7.55
Field pH	7.80	8.49	7.66	7.61	--	--
Temperature (°F)	66.2	63	70.5	--	--	72

a/ Preliminary analysis.

Adapted from Applicant's Environmental Report.

TABLE D-5
QUALITY OF WATERS IN SELECTED WELLS NEAR THE NORTH VALMY STATION
(CONDENTRATIONS IN PPM OR AS INDICATED)

	Well location/parameter											
	34-44-24cb	34-45-4cc	34-45-30da	34-45-22cd	35-43-11cb	32-45-20bc	32-45-20bc	33-44-12ab	34-43-16cb	43-43-27cc	37-42-2	37-42-1Cba
Date of sampling	6/18/75	8/21/74	8/21/74	8/21/74	6/18/75	7/16/66	9/10/66	6/18/75	6/17/75	5/23/72	6/18/75	6/18/75
Depth of screened interval, feet	110-259	50/213	100-400	125-206	Spring	508-533	400-500	300-400	47-192	120-258	a/	540
Iron, Fe	0.01	0.04	0.00	0.04	0.02	0.19	0.06	<0.01	<0.01	0.05	<0.01	<0.01
Manganese, Mn	<0.01	0.00	0.00	0.00	<0.01	--	0.03	<0.01	<0.01	--	<0.01	<0.01
Calcium, Ca	27.6	34	20	21	18.8	27	26	26.9	47.3	34	31	26.9
Magnesium, Mg	5.5	7	5	8	5.4	6	6	5.6	15.4	7	2.1	1.38
Sodium, Na	42.4	50	46	49	658	59[b/]	69[b/]	45.6	32.7	28[b/]	18.1	15.7
Potassium, K	7.81	8	8	8	29.7			8.70	3.50		2.4	2.95
Total hardness, as $CaCO_3$	91.55	114	71	85	69.17	94	90	90.22	181.49	112	86.05	72.85
Bicarbonate, HCO_3	123.7	149	105	115	1,599	177	181	146.8	190.9	105	90.3	76.9
Carbonate, CO_3	--	14	14	14	--	0	0	--	--	0	--	--
Sulfate, SO_4	36.9	31	29	31	159.6	40	43	38.5	55.8	45	28.8	27.3
Chloride, Cl	39.5	28	27	27	72	25	30	37	33.5	26	20.5	18
Nitrate, NO_3	--	4.8	5.7	5.9	--	--	1.9	--	--	3.0	--	--
Fluoride, F	--	2.06	1.22	1.56	--	--	0.8	--	--	0.12	--	--
Arsenic, As	--	0.005	0.010	0.020	--	--	0.02	--	--	0.005	--	--
Total dissolved solids	307	312	274	287	1,773	325	338	310	297	204	164	158
pH	8.00	8.36	8.36	8.38	8.25	8.1	7.9	7.92	7.86	7.49	86.05	8.12
Silica, SiO_2[c/]	65	--	--	--	39.3	--	--	72	19.5	--	22.5	30.4
Colloidal silica, SiO_2	61.5	--	--	--	45	--	--	--	24	--	23	32.5
Phosphate, ortho, P	0.01	--	--	--	0.04	--	--	<0.01	<0.01	--	<0.01	<0.01
Phospate, total, P	<0.01	--	--	--	0.04	--	--	<0.01	<0.01	--	<0.01	<0.01
Temperature, °F	60.8	--	--	--	91.4	--	--	68	64.4	--	64.4	62.6

Source: Applicant's Environmental Report.

a/ Data not available.
b/ Sodium and potassium calculated as sodium.
c/ Dissolved silica.

APPENDIX E
WILDERNESS RESOURCES

6111 - QUALITY EVALUATION OF RECREATION USE OPPORTUNITIES

Quality Evaluation Chart for Primitive Values

Quality Evaluation Chart

PRIMITIVE VALUES

KEY FACTORS	RATING CRITERIA AND SCORE		
(1) INTRUSIONS	Pristine or nearly so. Evidence of man's activities are minimal. 6	Some roads or other intrusions. But good potential for restoration. 4	Limited capacity for restoration but still some potential. 2
(2) SCENIC QUALITY	Most of the area falls in the Class A. 5	Most of the area is Class B or higher. 3	Most of the area is Class C. 2
(3) WILDLIFE	Large mammals present. Opportunities for viewing excellent. Generally 10 or more species. 3	Large mammals present. Opportunities for viewing restricted. Generally less than 10 species present. 2	Large mammals lacking or nearly so. 1
(4) FISHERIES	Potential for high fisherman success. Generally 3 or more desirable species. A major attraction. 3	Potential for moderete fisherman success. Mostly "B" class fishing opportunities. 2	Little or no potential for fisherman success. Mostly Class C opportunities. 1
(5) WATER USABILITY	Water bodies large enough to accommodate non-mechanized boating use and are a dominant attraction. 3	Same - except not dominant attraction. 2	Water bodies not large enough to accommodate boating. 1
(6) SIZE	Greater than 50,000 acres or excellent opportunities for isolation. 6	Between 5,000-50,000 acres or good opportunities for isolation. 4	Area less than 5,000 acres. 1
(7) * UNIQUENESS	Unique 6+	Rare 4	Common 1

*Compared to other similar type areas in the region.

A = 20 or more B = 15-20 C = 8-15

EXPLANATION OF RATING CRITERIA

(1) Intrusions. This criteria measures the degree of impact man has had on the land and the potential for restoration to a natural condition.

(2) Scenic Quality. Use the rating identified in the Scenery Quality evaluation.

(3) Wildlife. The variety of large mammals present in the area is used as an indicator of quality of experience. Following is a partial list of large mammals that should be considered in the evaluation:

Antelope	Elk
Bear	Fisher
Beaver	Fox
Bobcat	Javelina
Big Horn Sheep	Lynx
Bison	Martin
Burro	Moose
Caribou	Mountain Goat
Cougar	Musk Ox
Coyote	Wild Horses
Dall Sheep	Wolf
Deer	Wolverine

(4) Fisheries. The criteria is designed to measure the probable success a fisherman may expact in the area. Use the fishing quality evaluation as a basis for these ratings.

(5) Water Usability. This criteria has reference to the usability of water as a form of transportation and as a source of intereat and excitement, i.e., white water boating. Examples of dominate water attractions are:

- A rather extensive white water river system.
- A series of inter-connecting lakes that could be used for canoeing, etc.

(6) Size. This criteria is designed to measure the degree of isolation a visitor could experience. The size and general character of the area are the two variables which are used to measure this.

(7) Uniqueness. Use this factor to compensate for values not recognized in the other criteria. Is there something (not consider elsewhere) different or unusual about this area which would significantly add to the wilderness experience? The rater has the option to add whatever points he feels is necessary to give a feature a valid rating. Any score beyond 6 must be explained in the remarks column of the Quality Rating Score Sheet.

INSTRUCTIONS (See Sec. .1 for general procedures)

Purpose: To rate the quality of experience that a wilderness user can expect in the area.

How to Identify Primitive Value: Consider the following characteristics in identifying primitive areas: (Also see 6221.)

1. Contains natural, wild, and undeveloped lands in a setting essentially removed from the effects of civilization.
2. Has outstanding opportunities for solitude or a primitive and unconfined type of recreation.
3. Is of sufficient size as to make practicable its preservation and use in an unimpaired condition.
4. May also contain ecological, geological, or other features of scientific, educational, scenic, or historical value.

How to Determine Minimum Suitability for Evaluation:

A. Evaluate all roadless areas over 5,000 acres in size.

B. Evaluate roadless areas smaller than 5,000 acres if they are bounded by natural barriers that provide a feeling of isolation and if they contain high quality wilderness features identified in the rating criteria.

C. Evaluate large areas that have some impact from roads and other intrusions but contain other high quality wilderness features. should be evaluated.

How to Delineate Rating Areas: Use physiographic features such as large drainage basins, mountain ranges, etc. wherever possible. Place areas with similar characteristics into separate rating areas. For example, an area having no roads may form a rating unit providing all other factors are equal. Give emphasis to delineating large areas rather than small ones.

APPENDIX F

VISUAL RESOURCES

VISUAL RESOURCE ANALYSIS

Purpose: The intent of this study is to serve as a creditable and meaningful evaluation of the visual resource for a large area of north-central Nevada. The subject area is generally located within the roughly triangular area between Reno, Austin, and Valmy, Nevada (as shown on the ES Area Map). The subject area is currently under consideration by Sierra Pacific Power Company for location of a 500 Mw power plant and associated transmission lines from Valmy to Austin and Valmy to Reno.

Evaluation Process: The process utilized in this analysis has been recently developed by the Bureau of Land Management. A complete explanation of the procedure with examples of various phases appears in BLM Manual 6300 - Visual Resource Management. The overall objective is to provide a Bureau-wide, systematic approach for identifying scenery quality and setting minimum quality standards for management of the visual resource on public lands. Through the process, all public lands are classified into one of five visual resource management classes. Each of these classes contains a specific management objective for maintaining or enhancing the visual resource values. The visual management class assigned to a given land area depends upon three factors:

1. The inherent quality of the scenery being viewed.
2. The visual sensitivity level of the type of visual use it receives.
3. The visual zone it is in.

These three factors are analyzed through a six-step process to form visual management units. Briefly, these six steps are:

1. The determination and delineation of scenic quality.
2. The determination of the visual sensitivity level of each land area.
3. The identification and delineation of visual zones (the foreground, middleground, and background areas seen from travel routes or use areas).
4. The delineation and labeling of all areas where the combination of all three of the above factors are similar.
5. Assigning a visual resource management class to each of these areas.
6. The combining of contiguous areas of similar visual quality to form visual management units.

Scenic Quality: This process assigns a rating of: A-high scenic quality; B-moderate scenic quality; and C-low scenic quality, to all lands within a given area. The procedure

analyzes six key factors: land form, color, water, vegetation, uniqueness, and intrusions. Each of these factors is rated against a set of general critieria and a score assigned accordingly. When the evaluation is complete on a given land unit, the individual key factor scores are totalled and the letter rating A, B, or C is assigned, depending upon the total points received. Although the majority of the study area is rated C in terms of scenic quality, many A and B areas do exist. Many of the A and B areas are associated with the mountain-type and foothill-type landscape with the linear mountain ranges, particularly in the basin/range character type to the south of Interstate 80 in the Winnemucca and Battle Mountain area.

Visual Sensitivity Level: The next process in the evaluation is the determination of the visual sensitivity levels. (This, basically, is an indicator of people's concern for the relative importance or value of visual response to an area in relation to other areas within a given boundary.) One of the most important aspects of this procedure is criteria selection. Individual meetings were held with the Winnemucca and Battle Mountain BLM District Offices. In addition to these meetings, a recreation, cultural, and visual resource workshop was held where various factions of the public were invited to aid in determining the criteria we would use for the visual sensitivity level determination. From these meetings three visual sensitivity level criteria were determined. They are:

1. The use volume of all highway and secondary transportation routes.
2. The intensity of various recreation values.
3. Zones of influence.

These criteria and evaluation factors for determining what category they fall into, high, medium, or low, are found in the following table.

VISUAL SENSITIVITY

	High	Medium	Low
Use Volume	+600 Observers Per Day	60-600 Observers Per Day	-60 Observers Per Day

Recreation Values	3 or more major rec. values, i.e., - H_2O related - Winter - Non H_2O or Concentration of 2 or more specific activities with established high use	2 major rec. values or 1 specific activity with established high use	Other identified use
Zones of Influence	- Views from towns with +1000 pop. - Est. overlooks on highways	- Views from towns with less than 1000 pop. - Historic marker sites - Road side rest area	- All other

Most of the subject area falls into the medium sensitivity level however, some areas of considerable acreage are identified as having a high sensitivity level.

Visual Zones: The final major step in the process is the determination of visual zones. These zones, which are areas actually seen from key observer positions such as highways, well traveled roads, overlooks, recreation sites, etc., are classified into three units.

1. Foreground-middleground zone - The foreground-middleground zone is the area visible from an observer position for a distance of five miles where management activities might be viewed in detail. The outer boundary of this zone is defined as the point where the texture and form of individual

plants are no longer apparent in the landscape.

2. Background - The background is the viewshed which lies beyond the foreground-middleground zone from five miles to a maximum of 15 miles.
3. Seldom Seen Zone - All areas not identified in the two previous zones are considered to be in the seldom seen zone. Generally, these are areas seen from low-use transportation routes or are beyond the 15-mile background zone.

Assigning Resource Management Classes: Following the identification and delineation of the three previous evaluation factors, all areas of common characteristics were mapped and labeled. Utilizing the following matrix, a visual resource management class was then assigned to each of the units with common characteristics. For example, all areas in Class B scenery, high sensitivity level and in the background zone, would be in Class III visual resource management class.

Chart for Determining Visual Resource Management Class

		VISUAL SENSITIVITY LEVEL 2/						
		HIGH			MEDIUM			LOW
SPECIAL AREAS		I	I	I	I	I	I	I
SCENERY 1/ CLASS	A	II	II	II	II	II	II	II
	B	II	III	IV	III	IV	IV	IV
	C	III	IV	IV	IV	IV	IV	IV
		FG	BG	SS	FG	BG	SS	SS
		VISUAL ZONES 3/						

1/ SCENERY QUALITY INVENTORY: A, B, C

2/ VISUAL SENSITIVITY LEVEL: High, Medium, Low

3/ VISUAL ZONES: FG - Foreground-Middleground
BG - Background
SS - Seldom Seen

Note: Class I applies only to classified special areas, e.g., Wilderness, Primitive, Natural Areas, etc. This quality standard is established through legislation or policy.

Class V applies to areas identified in the scenery quality inventory where the quality class has been reduced because of unacceptable intrusions.

In this study three visual resource management classes were identified. Each of these classes described the visual resource value in terms of highly significant, moderately significant, or significant and the different degrees of modification allowed in the basic elements of the landscape. They are:

CLASS II

Changes in any of the basic elements (form, line, color, or texture) caused by a management activity should not be evident in the characteristic landscape.

CLASS III

Changes in the basic elements (form, line, color, or texture) caused by a management activity may be evident in the characteristic landscape; however, the changes should remain subordinate to the visual strength of the existing character.

CLASS IV

Changes may subordinate the original composition and character, but must reflect what could be a natural occurrence within the characteristic landscape. The visual resource management classes are delineated on the Visual Resource Management Map, p. 2-75 .

VISUAL CONTRAST RATING

The BLM has devised a visual resource contrast rating method to measure the impact of proposed activities to determine whether or not they meet the standards for each visual resource management class. A complete explanation of this system can be found in the 6320 section of the BLM Manual.

Briefly, the system is based on the premise that the degree to which a management activity adversely impacts the visual quality of the landscape depends upon the amount of visual contrast that is created between the activity and the existing landscape character. The amount of contrast between a proposed activity and the existing landscape character can be measured by separating the landscape into its major features (land form features,

vegetation, and structures), and then predicting the magnitude of change in contrast of each of the basic elements (form, line, color, and texture) to each of the features. Assessing the amount of contrast for a proposed activity in this manner can give a good indication of the severity of impact and serve as a guide in determining what is required to reduce the contrast to the point where it will meet the visual resource management classes for the area.

Use of the Contrast Rating - The contrast rating must be applied in the planning stages to all proposed land management activities that will disturb the soil, change or remove vegetation, or place a structure in the landscape. It should also be applied to all areas that are identified as needing rehabilitation or enhancement. Application of the contrast rating system should be done from the most critical view point or points that are or will be commonly in use although a general "overall" application can be made to give an indication of the impact by the proposed activity. When applying the rating system, keep in mind the following variables are the factors which determine how well the contrast is seen:

- Distance from which the project will be viewed.
- Angle of observation. The apparent size of a management activity is directly related to the angle between the viewers' line-of-sight and the slope being viewed. As this angle nears 90^{o}, the maximum area is viewable and becomes most critical.
- Length of time the project is in view. If the viewer has only a brief glimpse of the project, the contrast can almost be disregarded. If, however, the project is subject to view for a long period, as from an overlook, the opportunity to detect contrast becomes very critical.
- Relative size or scale of the project in relation to its surroundings.
- Season of the year and the effects of seasonal changes. Contrast rating should be done considering the heavy or most critical use season.
- Light and how it will effect the project being viewed.
- The effect time has on the healing process. Few projects can be expected to meet the visual classes immediately upon completion.

With some long-term projects, such as a strip mine, it may be desirable to have both short-term (5 years) and long-term objectives (completion of the project).

Visual Constrast Application

Landscape Description - Write a brief description of the exist-

ing landscape. Describe each of the landscape features (land form, vegetation, structures) in terms of the basic elements (form, line, color, texture).

Activity Description - Briefly describe and define the proposed activity or project. Tell how it will be accomplished and the anticipated impacts on the landscape by feature and element.

Methodology - The visual contrast created by a management activity can be measured by determining the contrast caused by that activity in each of the basic elements.

The ease of detecting contrast in the basic elements varies on a scale from 4 (form) to 1 (texture). By assigning values that indicate degree of contrast, 3 for strong, 2 for moderate, and 1 for weak, we can set up a direct multiplier for an indication of the strength of the contrast.

Elements

Form	- 4
Line	- 3
Color	- 2
Texture	- 1

Degree of Contrast

Strong	- 3
Moderate	- 2
Weak	- 1
None	- 0

The following rating sheet is then used to evaluate the proposed action.

VISUAL RESOURCE CONTRAST RATING SHEET

Project: _____

Landscape Character Type: _____

	Element	Contrast	Score	Maximum Score Possible
Land Form Features	Form - 4 X			
	Line - 3 X			
	Color - 2 X			
	Texture- 1 X			

	Total Land Form Feature Score ___		30
Vegetation Features	Form - 4 X	_____	
	Line - 3 X	_____	
	Color - 2 X	_____	
	Texture- 1 X	_____	
	Total Vegetation Feature Score __		30
Structures Features	Form - 4 X	_____	
	Line - 3 X	_____	
	Color - 2 X	_____	
	Texture- 1 X	_____	
	Total Structures Feature Score __		30

Individual Feature Scores:

1-10:	Indicated contrast can be seen, but does not attract attention.
11-20:	Attracts attention, the contrast begins to dominate the characteristic landscape.
21-30:	Demands attention, will not be overlooked.

Degree of Contrast:

Strong	- 3
Moderate	- 2
Weak	- 1
None	- 0

Note: Refer to BLM Manual 6230 for complete explanation of the contrast rating system.

Contrast Rating as a Measure of Meeting Established Visual Resource Management Classes - The following is applied to determine if the proposed activity will meet the visual resource management class assigned to an area.

Class I. The contrast rating for any one element may not exceed 1 (weak) and the total contrast rating for any feature must be less than 10.

Class II. The contrast rating for any one element should not exceed 2 (moderate) and the total contrast rating for any feature may not exceed 10.

Class III. The contrast rating for any one element should not exceed 2 (moderate) and the total contrast rating for any feature may not exceed 16.

Class IV. The total contrast rating for any feature should not exceed 20.

Class V is an interim classification for rehabilitation or enhancement of an area. Based upon its indicated potential visual resource management class (II, III, or IV), select the appropriate contrast rating.

Contrast Rating - Using the methodology described, determine a contrast rating for the proposed activity. The rating quickly points out the elements and the features that will cause the greatest visual impact. This provides a guide to the most effective method of reducing the visual impact of a proposed activity or project. Those elements with the highest contrast rating are the ones that can be attacked and lowered most effectively.

If the activity does not meet the requirements for the VRM Class that has been established for the area, look at the rating scores and see what can be done to reduce the impact more effectively, then redesign the project and run through the rating process again. If the proposed activity still will not meet the requirements of the VRM Class, a landscape architect should be called in to re-assess the design. If the VRM Class requirements still cannot be met, a written recommendation by the landscape architect should be made to the District Manager to either go ahead with the proposal with the impacts reduced as much as possible, revise the proposal, or abandon the proposal in favor of the protection of the visual resource.

APPENDIX G

SOCIAL-ECONOMIC FACTORS

(INCLUDING SUMMARY OF NEED DATA)

SUMMARY OF NEED DATA FOR THE PROJECT

In support of its request to the Nevada Public Service Commission for approval of the North Valmy project, the Applicant developed projections for future electrical requirements within their Service Area based on estimated population growth and other factors such as reliability criteria and increased agricultural, industrial, and tourism/gaming activities.

The Applicant's projections, coupled with past demand patterns (see Tables G-7 and G-8 in this Appendix) were then used to arrive at projected energy requirements, including peak demands (Tables G-1 and G-2).

Based on the hearing record developed from testimony and cross examination of the Applicant's witnesses and all intervenors, the Nevada Public Service Commission was able to analyze, among other factors, the stated need for the North Valmy project. On June 29, 1977 the Commission issued its opinion and order (Docket No. 732) approving Unit #1 and denying Unit #2. Key to this determination regarding Unit #2 was the Commission's statement that

> "...The need for Valmy Unit No. 2, which the Applicant has proposed to be in service by 1984, was not clearly established by the Applicant. The Applicant's witness Jones testified upon cross-examination that in making the peak load projection he did not consider any quantitative conservation, peak load pricing alternatives, load leveling devices, or interruptible loads. Jones also testified that Applicant was studying some of these alternatives and would require a full year's experience to make a determination of their effect on peak load projections. Staff witness Polosky testified that in his opinion the determinatior of the necessity for Valmy Unit No. 2 should not be made until the peak loads for 1977 and 1978 are experienced. He testified that an analysis of two additional years of load data would provide a more definitive conclusion as to the required commercial operation data for Valmy Unit No. 2.
>
> The Commission is of the opinion that the additional data and the variables discussed above may have an effect on the need for Valmy Unit No. 2 and its operational data and that they should be further analyzed by the Applicant..."

Additionally, the Commission's opinion contained the following findings and conclusions:

1. That the application on file herein comes within the purview of the statutes of the State of Nevada and within the regulatory jurisdiction of this Commission;

2. That the instant application and all notices thereto are in compliance with the law;

3. That Applicant is charged by law with providing adequate and reliable power for all customers within its certificated area;

4. That the basis for the need for Valmy Unit No. 1 and its associated facilities and transmission lines has been demonstrated and permission to construct should be granted upon compliance with the items set forth on page 18 of this Opinion and item 12 of the Findings and Conclusions;

5. That the location of the proposed facilities of both Valmy Unit No. 1 and Unit No. 2 conforms to the requirements of applicable state laws and regulations considered within this Commission's jurisdiction;

6. That the location of the proposed facilities represents the minimum adverse environmental impact, considering the state of available technology, and the nature and economics of the various alternatives and other pertinent considerations;

7. That the granting of a permit to construct Valmy Unit No. 1 will serve the public interest, which requires adequate and reliable service;

8. That the need for construction and the in-service date of Valmy Unit No. 2 and its associated transmission lines was not established by the evidence of record in this case;

9. That the Commission does not have sufficient evidence before it to determine the environmental impact of the proposed generation and transmission facilities of Valmy Unit No. 2;

10. That a permit to construct Valmy Unit No. 2 should be denied at this time and that Applicant must file a new application to construct Valmy Unit No. 2 if and when said facility is deemed necessary;

11. That the construction of common facilities which may be necessary for both Valmy Unit No. 1 herein authorized and No. 2 to be considered at a later date and which could not be feasibly and economically built separate and apart from construction of

Unit No. 1 should be permitted upon issuance of the permit to construct hereinafter authorized; provided, however that construction of such common facilities should be limited to the bare minimum necessary; and

12. That upon receipt of evidence of compliance with the requirements set forth in Finding and Conclusion No. 4 hereinabove, the Commission should issue a permit to construct Valmy Unit No. 1 and its associated facilities and transmission lines.

An appropriate Compliance Order will be entered.

TABLE G-1
ANNUAL ONE-HOUR PEAK DEMAND (Mw)

Projected	Total system capability[a] (Mw)	Abnormally warm	Normal weather	Abnormally cold	Normal weather annual rate of growth (percent)
1977	819	511	577	643	7.77
1978	869	549	620	691	7.47
1979	869	588	664	740	7.18
1980	869	628	710	792	6.91
1981	1,119	669	757	845	6.64
1982	1,119	710	805	900	6.38
1983	1,119	753	855	957	6.14
1984	1,369	795	905	1,015	5.90
1985	1,369	839	957	1,075	5.67
1986	1,369	881	1,009	1,137	5.46
Average					6.6

a/ Purchased power plus generation.

Source: Applicant's Environmental Report.

TABLE G-2
ENERGY REQUIREMENTS, 1977-1986

Year projected	Net system requirements (Mwh)	Annual rate of growth (percent)
1977	3,106,775	5.67
1978	3,434,591	10.55
1979	3,729,352	8.58
1980	3,973,602	6.55
1981	4,293,488	8.05
1982	4,708,028	9.66
1983	4,946,395	5.06
1984	5,218,896	5.51
1985	5,459,720	4.61
1986	5,677,092	3.98
Average		6.82

Source: Applicant's Environmental Report.

TABLE G-3
LIST OF COUNTIES AND SUBDIVISIONS

California

- Alpine County
  - Markleeville subdivision
- El Dorado County
  - Lake Valley subdivision
- Mono County
  - Mono North subdivision
  - Mono South subdivision
- Nevada County
  - Donner subdivision
- Placer County
  - Colfax-Summit subdivision
  - Foresthill-Back Country subdivision
  - Lake Tahoe subdivision
- Plumas County
  - Portola subdivision
- Sierra County
  - East Sierra subdivision
  - West Sierra subdivision

Nevada

- Carson City
- Churchill County
- Douglas County
- Esmeralda County
- Humboldt County
- Lander County
- Lyon County
- Mineral County
- Nye County
- Pershing County
- Storey County
- Washoe County

TABLE G-4
HUMBOLDT COUNTY
LOCAL GOVERNMENT TAXING UNITS ASSESSED VALUATION
1970-75[a/]

Local government taxing unit	Assessed valuation (dollars) Fiscal years 1970-71	1971-72	1972-73	1973-74	1974-75	1975-76
Humboldt County	33,672,860	35,401,205	34,576,779	39,261,126	44,305,889	51,080,492
Winnemucca	9,270,191	9,774,911	10,041,032	11,349,340	12,166,588	13,333,477
Golconda Fire Protection District	5,000,174	5,014,732	4,773,744	5,429,525	5,784,478	7,112,855
Humboldt Fire District	N.A.	N.A.	N.A.	272,537	289,127	319,980
McDermitt Fire Protection District	1,771,416	1,768,229	885,461	975,477	959,105	1,328,714
Orovada Fire Protection District	1,909,237	1,969,040	2,067,288	2,288,734	2,500,604	3,335,773
Paradise Valley Fire Protection District	2,018,751	2,083,911	2,211,028	2,568,980	2,674,173	5,356,053
Pueblo Fire Protection District	605,616	635,712	731,401	807,106	851,532	1,526,789
Winnemucca Rural Fire Protection District	3,129,990	3,188,285	3,435,116	5,300,137	5,297,943	7,445,713
Humboldt County schools	33,672,860	35,401,205	34,576,779	39,361,126	44,305,889	51,080,492

a/ Nevada Tax Commission, Local Government Red Book: Ad Valorem Tax Rates, Budget Summaries for Nevada Local Governments, 1970-75.

TABLE G-5
LANDER COUNTY
LOCAL GOVERNMENT TAXING UNITS ASSESSED VALUATION, 1970-76[a/]

Local government taxing unit	Assessed valuation (dollars) Fiscal years					
	1970-71	1971-72	1972-73	1973-74	1974-75	1975-76
Lander County	20,274,057	20,018,369	21,054,114	21,997,931	23,500,000	26,100,000
Austin Town	304,255	310,040	333,942	378,338	416,393	452,323
Battle Mountain Town	2,145,374	2,157,621	2,227,267	2,435,530	2,626,607	2,780,159
Lander County Sewer and Water District #1	2,145,374	2,157,621	2,227,267	--	--	--
Lander County Sewer and Water District #2	304,255	310,040	333,942	378,338	416,393	452,323
Lander County schools	20,274,057	21,018,369	21,054,114	21,997,931	23,500,000	26,100,000

a/ Nevada Tax Commission, Local Government Red Book: Ad Valorem Tax Rates, Budget Summaries for Nevada Local Governments, 1970-75.

TABLE G-6
HUMBOLDT COUNTY PERSONAL INCOME BY MAJOR SOURCES 1970-74 (THOUSANDS OF DOLLARS)

Item	1970	1971	1972	1973	1974
Total labor and proprietors income by place of work.[1/]					
By type:					
Wage and salary disbursements[2/]	15,204	15,270	16,291	19,455	22,512
Other labor income	716	632	729	912	1,103
Proprietors income	4,134	4,684	4,581	6,245	4,859
Farm	2,036	2,121	2,580	4,345	2,839
Nonfarm	2,098	2,563	2,001	1,900	2,020
By industry:					
Farm	3,428	3,598	4,044	5,989	4,766
Nonfarm	16,626	16,988	17,557	20,623	23,708
Private[3/]	12,888	12,883	13,083	15,696	18,409
Manufacturing	296	322	408	838	1,200
Mining	(D)	(D)	(D)	(D)	(D)
Contract construction	971	1,021	851	1,848	2,728
Wholesale and retail trade	4,164	4,573	4,813	5,318	5,880
Finance, insurance, and real estate	404	449	561	336	383
Transportation, communication, public utilities	1,969	2,384	2,629	3,024	3,335
Services	3,370	3,520	3,806	4,112	4,673
Other industries	(D)	(D)	(D)	(D)	(D)
Government	3,738	4,105	4,474	4,927	5,299
Federal, civilian	842	938	1,001	1,049	1,129
Federal, military	95	102	114	127	137
State and local	2,801	3,065	3,359	3,751	4,033
Derivation of personal income by place of residence.					
Total labor and proprietors income by place of work	20,054	20,585	21,601	26,612	28,474
Less: personal contributions for social insurance by place of work	752	752	804	1,049	1,303
Net labor and proprietors income by place of work	19,302	19,834	20,797	25,513	28,474
Plus: residence adjustment	- 393	- 366	- 370	- 478	- 554
Net labor and proprietors income by place of residence	18,909	19,468	20,427	25,035	26,617
Plus: dividends, interest, and rent	3,034	3,259	3,378	4,698	5,333
Plus: transfer payments	2,192	2,598	2,872	3,387	3,768
Personal income by place of residence	24,135	25,325	26,677	33,120	35,718
Per capita income	3,753	4,013	4,104	4,974	5,530
Total population (thousands)	6.4	6.3	6.5	6.7	6.5

1/ Equals the sum of wages, other labor income and proprietors income.

2/ Primary source for private nonfarm wages: ES-202 covered wages--Nevada Employment Security Department.

3/ (D)-not shown to avoid disclosure of confidential information. Data are included in totals.

Source: Bureau of Economic Analysis, Regional Economics Information System.

TABLE G-7
LANDER COUNTY PERSONAL INCOME BY MAJOR SOURCES 1970-74 (THOUSANDS OF DOLLARS)

Item	1970	1971	1972	1973	1974
Total labor and proprietors income by place of work.[1/]					
By type:					
Wage and salary disbursements[2/]	7,882	8,281	9,207	10,422	13,550
Other labor income	664	512	577	656	858
Proprietors income	1,180	1,483	1,316	2,090	1,389
Farm	696	794	1,061	1,559	824
Nonfarm	484	689	255	531	565
By industry:					
Farm	1,159	1,286	1,547	2,106	1,466
Nonfarm	8,547	8,990	9,553	11,062	14,331
Private[3/]	6,736	6,966	7,334	8,637	11,728
Mining	(D)	(D)	(D)	(D)	(D)
Contract construction	(D)	(D)	(D)	(D)	(D)
Wholesale and retail trade	1,059	1,105	1,229	1,195	1,407
Finance, insurance, and real estate	(D)	(D)	(D)	(D)	(D)
Transportation, communications, public utilities	(D)	246	323	340	392
Services	397	463	421	390	364
Other industries	74	89	93	92	98
Government	1,811	2,024	2,219	2,425	2,603
Federal, civilian	712	818	876	971	1,042
Federal, military	40	42	48	49	55
State and local	1,059	1,164	1,295	1,405	1,506
Derivation of personal income by place of residence.					
Total labor and proprietors income by place of work	9,706	10,276	11,100	13,168	15,797
Less: personal contributions for social insurance by place of work	365	401	458	584	775
Net labor and proprietors income by place of work	9,341	9,875	10,642	12,584	15,022
Plus: residence adjustment	- 589	- 602	- 678	- 774	- 1,109
Net labor and proprietors income by place of residence	8,743	9,273	9,964	11,810	13,913
Plus: dividends, interest, and rent	901	1,044	1,192	1,598	1,819
Plus: transfer payments	722	835	910	1,010	1,216
Personal income by place of residence	10,366	11,152	12,066	14,418	16,948
Per capita income	3,855	4,283	4,469	5,322	5,989
Total population (thousands)	2.7	2.6	2.7	2.7	2.8

1/ Equals the sum of wages, other labor income and proprietors income.

2/ Primary source for private nonfarm wages: ES-202 covered wages--Nevada Employment Security Department.

3/ (D)-not shown to avoid disclosure of confidential information. Data are included in totals.

Source: Bureau of Economic Analysis, Regional Economics Information System.

TABLE G-8
SIERRA PACIFIC POWER COMPANY SYSTEM ONE HOUR PEAK DEMAND

	Historical winter demand (Mw)			
Year	Cold (15°F)	Normalized (37°F)	Warm (59°F)	Experienced
1966	258	236	214	237
1967	281	251	221	260
1968	327	290	253	288
1969	339	303	267	310
1970	367	336	305	339
1971	411	367	323	379
1972	406	359	312	420
1973	422	392	364	405
1974	531	465	399	489
1975	554	511	468	476
1976	596	535	474	493

Source: Applicant's exhibits for Nevada Public Service Commission Hearings.

TABLE G-9
ELECTRIC CUSTOMER GROWTH 1967-1976 (ACTUAL)

	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	Ten-year average annual growth rate
Nevada electric:											
Residential	44,196	46,534	50,174	54,594	59,111	64,298	70,302	75,205	78,814	82,467	--
Percent increase over prior year	1.08	5.29	7.82	8.81	8.27	8.78	9.34	6.97	4.80	4.63	6.58
Commercial and industrial-small	7,908	8,337	8,955	9,841	10,594	11,296	12,015	12,771	13,315	13,852	--
Percent increase over prior year	(.57)	5.42	7.41	9.89	7.65	6.63	6.37	6.29	4.26	4.03	5.74
California electric:											
Residential	15,006	15,026	15,276	16,100	16,988	18,262	19,989	21,767	23,158	24,451	--
Percent increase over prior year	3.01	.13	1.66	5.39	5.52	7.50	9.46	8.89	6.39	5.58	5.35
Commercial and industrial-small	2,476	2,586	2,699	2,866	3,080	3,356	3,612	3,739	3,811	4,013	--
Percent increase over prior year	1.98	4.44	4.37	6.19	7.47	8.96	7.63	3.52	1.93	5.30	5.18
Total electric:											
Residential	59,202	61,560	65,451	70,694	76,099	82,560	90,291	96,972	101,972	106,918	--
Percent increase over prior year	1.56	3.98	6.32	8.01	7.65	8.49	9.36	7.40	5.16	4.85	6.28
Commercial and industrial-small	10,384	10,923	11,653	12,706	13,675	14,652	15,627	16,510	17,126	17,865	--
Percent increase over prior year	.03	5.19	6.68	9.04	7.63	7.14	6.65	5.65	3.73	4.32	5.61
"All electric" customers included above:											
Nevada	701	978	1,238	1,500	1,850	2,608	3,274	3,889	4,340	4,800	--
Percent of total Nevada residential customers	1.59	2.10	2.47	2.75	3.13	4.06	4.66	5.17	5.51	5.82	3.73
California	795	967	1,098	1,247	1,222	1,500	1,762	2,092	2,450	3,281	--
Percent of total California residential customers	5.30	6.44	7.19	7.75	7.13	8.21	8.81	9.61	10.58	13.42	8.44

Source: Applicant's exhibits for Nevada Public Service Commission Hearings.

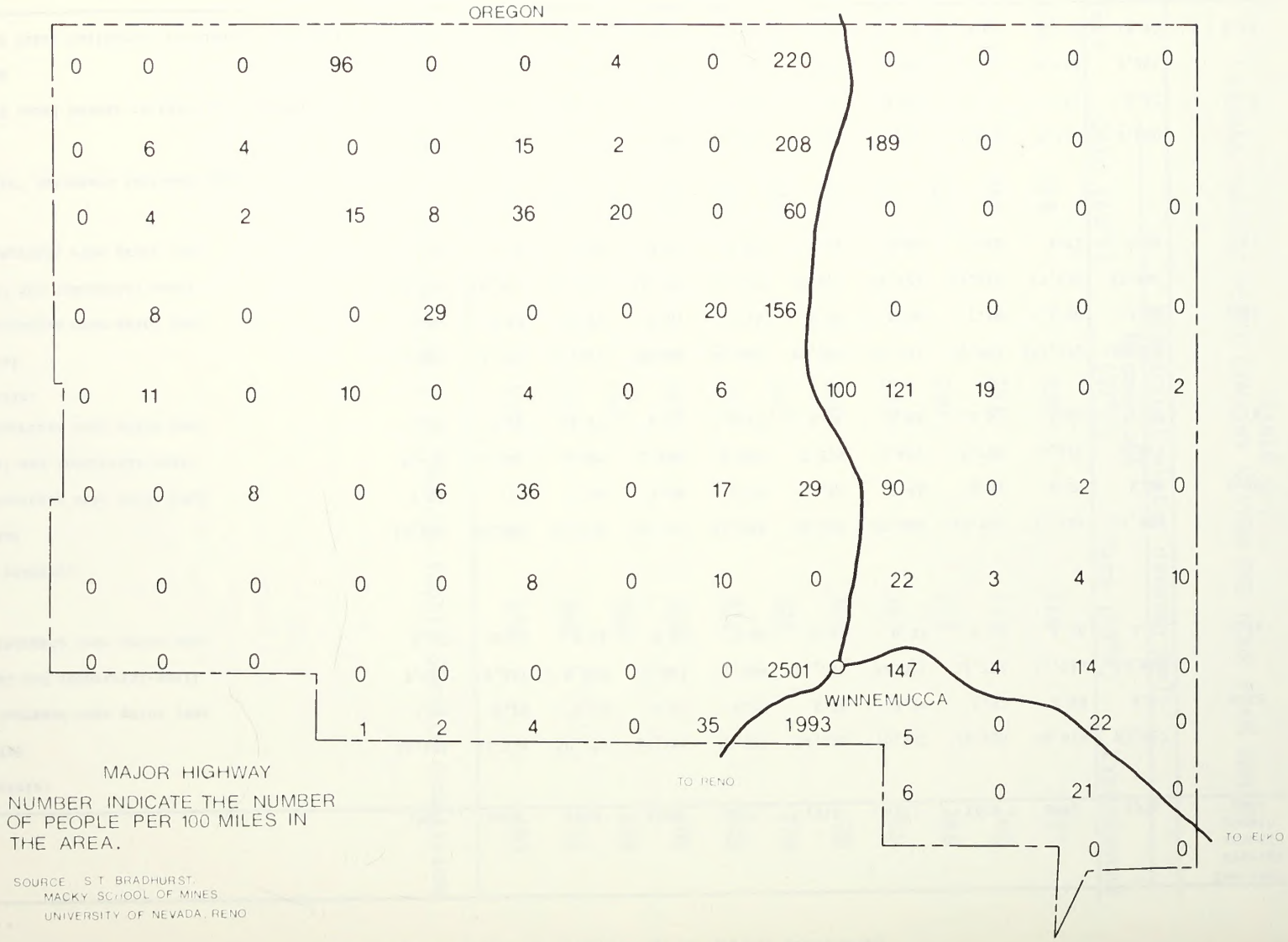


FIGURE G-1 — 1970 POPULATION DISTRIBUTION, HUMBOLDT COUNTY

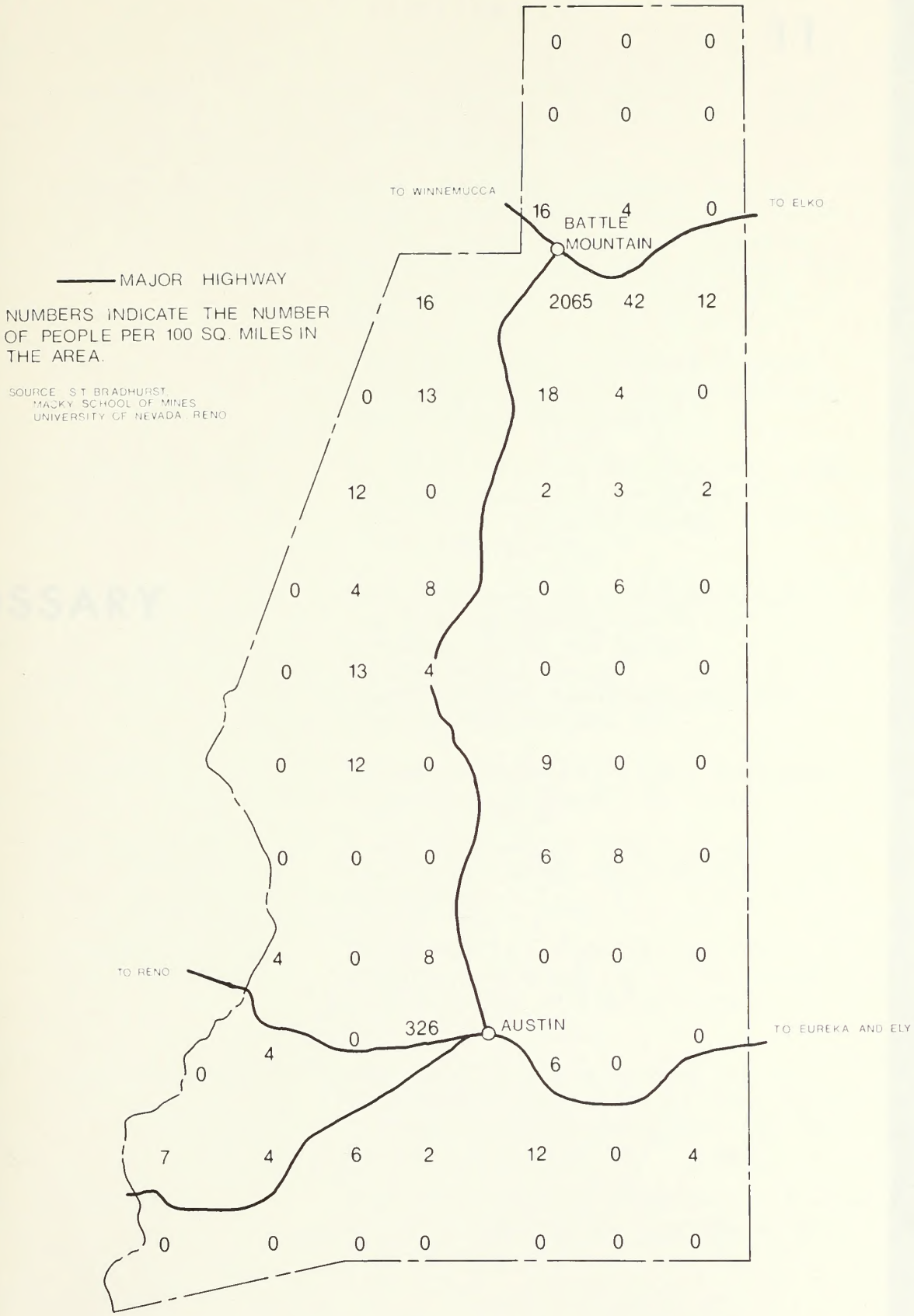

0 0 0
0 0 0
TO WINNEMUCCA
16 4 0
TO ELKO
BATTLE MOUNTAIN
MAJOR HIGHWAY
NUMBERS INDICATE THE NUMBER OF PEOPLE PER 100 SQ. MILES IN THE AREA.
SOURCE: S.T. BRADHURST, MACKY SCHOOL OF MINES, UNIVERSITY OF NEVADA, RENO
16 2065 42 12
0 13 18 4 0
12 0 2 3 2
0 4 8 0 6 0
0 13 4 0 0 0
0 12 0 9 0 0
0 0 0 6 8 0
4 0 8 0 0 0
TO RENO
0 326 AUSTIN 0
TO EUREKA AND ELY
4
0
6 0
7 4 6 2 12 0 4
0 0 0 0 0 0 0

FIGURE G-2 1970 POPULATION DISTRIBUTION, LANDER COUNTY

GLOSSARY

GLOSSARY

acre-foot - The amount of water necessary to cover one acre to a depth of one foot, equaling 43,560 cubic feet.

alluvial fan - A low, outspread, relatively flat to gently sloping mass of loose rock material, shaped like an open fan, deposited by a stream at the place where it issues from a narrow canyon or wash onto a plain or valley.

alluvium - Clay, silt, sand, and gravel or other rock material transported and eventually deposited by flowing water.

Animal Unit Month - Pounds of forage or feed required to sustain an animal unit (one cow or five sheep) for a period of 30 days. (Abbreviated AUM, AUMs.)

background - That portion of the visual landscape lying from the middleground limits out to infinity. Color and texture are subdued in these areas, which are primarily concerned with the two-dimensional shape of landforms against the sky.

circuit - A complete closed conducting path over which electric current may flow.

circuit breaker - A switching device capable of opening an electrical circuit under abnormal load conditions.

community - An aggregate of organisms which form a distinct ecological unit. Such a unit may be defined in terms of plants, animals, or both.

critical habitat - Habitat of a limited nature, such as a deer winter range, which is vital to the survival of a particular species or population.

conductor - A material, usually in the form of a wire or cable, suitable for carrying an electric current.

cultural resources - Objects, structures, sites and districts that pertain to native peoples or other communities; they are generally classified as either historic or prehistoric (archaeologic). Such areas are of importance because of their educational, interpretative and/or scientific value, because they are vital to the preservation of a subculture, or because they are representative examples.

current (electric) - The movement of electrons along a conductor.

double circuit - Two electrical circuits strung through a single tower structure.

ecology - The study of the relationships of organisms or groups of organisms to their environment; animals and plants in their relation to each other.

ecotype - A subdivision of a species that comprises individuals inter-fertile with each other and with members of other ecotypes of the same species but surviving as a distinct group through environmental selection and isolation.

emergent vegetation - A plant rooted in shallow water and having most of its vegetative growth above water.

endangered species - (a) Federal regulation: any species which is in danger of extinction throughout all or a significant portion of its range other than a species of the class Insecta determined by the Secretary of the Interior to constitute a pest whose protection would present an overwhelming and overriding risk to man.
(b) State of Nevada regulation: any species whose prospects of survivial and reproduction are in immediate jeopardy.

environment - All that surrounds an organism and interacts with it.

evapotranspiration - The total water returned to the atmosphere from the land by evaporation and by plant transpiration.

fauna - Animal life of a region, period, or special environment (includes mammals, reptiles, amphibians, birds, fishes, insects, etc).

flora - The plant life of a region, period, or special environment.

foreground - That portion of the visual landscape lying generally from one-quarter to one mile beyond the viewer. Details of human-size features are visible at this distance, and all features are large scale elements.

fugitive dust - Any dust particles which become airborne other than those being emitted by a stack or chimney.

groundwater - That part of the subsurface water that completely saturates the rocks and is under hydrostatic pressure.

guy - A strand used to balance the horizontal forces on a pole or tower.

habitat - A specific environment which surrounds a species, a group of species, or a large community. In wildlife management, the major components of habitat are considered to be food, water, cover, and living space.

insulator - A device that is resistant to the conduction of electricity used for isolating and supporting conductors.

intertie - A transmission line linkage joining two or more load systems or utility systems through which power produced by one can be utilized by the other.

kilovolt (kv) - 1000 volts (a volt is a measure of electrical potential difference which will cause a current of one ampere to flow through a conductor whose resistance is one ohm).

load center - The point at which electrical loads of a given area are assumed to be concentrated for purposes of analysis.

middleground - That portion of the visual landscape lying generally between the limits of the foreground (about one mile) to eight miles beyond the viewer. Overall patterns of vegetation and earthform constitute texture which is no longer distinguishable in human-size features.

megawatts (Mw) - 1000 kilowatts or one million watts (a watt is a unit of electrical power equal to 1/756th horsepower).

ohm - Unit of electrical resistance.

perennial - Enduring; reoccurring year after year with the seasons.

perennial yield - The amount of groundwater which can be removed from a hydrographic area each year without depleting the groundwater reservoir.

primitive values - Characteristics used to identify or evaluate natural, wild, and undeveloped lands. Factors include opportunities for solitude or primitive and unconfined recreation and sufficient size to make practicable preservation and use in an unimproved condition.

rare species - State of Nevada regulation: one that, although not presently threatened with extinction, is in such small numbers throughout its range that it may be endangered if its environment worsens, requiring a necessary close observation of its status.

raptor - A bird of prey, such as an eagle or hawk.

riparian vegetation - Vegetation related to or living on the bank of a natural watercourse or lake.

submergent vegetation - Vegetation normally covered entirely with water.

substation - A station on an electrical power system with the purpose of routing and controlling electrical power and for transforming power to a higher or lower voltage.

threatened species - (Federal regulation): any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

volt - See kilovolt.

voltage - The electrical potential or potential difference expressed in volts.

watt - See megawatt.

wilderness - A wilderness, in contrast with those areas where man and his own works dominate the landscape, is recognized as an area where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain. An area of wilderness is further defined to mean in the Wilderness Act an area of undeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions and which (1) generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable; (2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation; (3) has at least 5,000 acres of land or is of sufficient size as to make practicable its preservation and use in an unimpaired condition; and (4) may also contain ecological, geological, or other features of scientific, educational, scenic, or historical values.

wilderness study area - A roadless area which has been inventoried and found to have wilderness characteristics as described in section 2(c) of the Wilderness Act of 1964.

wind rose - A diagram showing for a given place the relative frequency or frequency and strength of winds from different directions.

BIBLIOGRAPHY

BIBLIOGRAPHY

Alexander, E. B., and Peterson, F. F. Reconnaissance Soil Survey-Dixie Valley Area, Nevada. Carson City, Nevada: State Printing Office, 1974. (Published in cooperation with the State of Nevada Department of Conservation and Natural Resources, Division of Water Resources.)

Artz, J. L.; Price, J. B.; Peterson, F. F.; Summerfield, H. B.; Eckert, R. E.; Post, R. L.; Ritter, N. R.; and Skou, S. H. Plantings for Wildlands and Erosion Control. Reno, Nevada: University of Nevada, 1970. (Published in cooperation with U. S. Department of Agriculture, Soil Conservation Service.)

Bailey, R. M.; Lachner, E. A.; Lindsey, C. C.; Robins, C. R.; Roedel, P. M.; Scott, W. B.; and Woods, L. P. A List of Common and Scientific Names of Fishes from the United States and Canada: American Fisheries Society Special Publication No. 2. Washington, D. C.: American Fisheries Society, 1960.

Barneby, R. C. "A New Species of Ascelpias." Leaflets of Western Botany, 4(8) (1945): 210-212.

_____. Atlas of North American Astragalus. Memoirs of the New York Botanical Garden, 13 (1964).

Beeler, Don. "Recreation Use of the Proposed Upper Humboldt Reservoirs." Reno, Nevada: University of Nevada, Max C. Fleischmann College of Agriculture, 1972.

Bernstein, L. Salt Tolerance of Grasses and Forage Legumes. U. S. Department of Agriculture Information Bulletin No. 194. Washington, D. C. Government Printing Office, 1958.

Bleak, A. T.; Frischknecht, N. C.; Plummer, A. P.; and Eckert, R. E., Jr. "Problems in Artificial and Natural Revegetation of the Arid Shadscale Vegetation Zone of Utah and Nevada." Journal of Range Management, 18 (1965): 59-65.

Bronson, F. A.; Miller, R. F.; and McQueen, I. S. "Geographic Distribution and Factors Affecting the Distribution of Salt Desert Shrubs in the United States." Journal of Range Management, 20(5) (1965): 287-296.

Chilton Engineers, Inc. "Preliminary Engineering Report of Rock Creek Reservoirs." Elko, Nevada: Chilton Engineers, Inc., (no publication date).

Chu, Shih-Fan, and Wofford, B. M. An Econometric Model for the State of Nevada: Research Report No. 12. Reno, Nevada: University of Nevada, Bureau of Business and Economic Research, 1974.

County Supervisor's Association of California. County Fact Book 1975. Sacramento, California. 1975.

Dasmann, Dr. Raymond F. Environmental Conservation. New York: John Wiley and Sons, Inc., 1959.

Davis, Jonathan O.; Fowler, Don D.; and Rusco, Mary K. "Archaeological Investigations Near Treaty Hill, Humboldt County, Nevada." (Technical Report No. 2) Reno, Nevada: Desert Research Institute, Human Systems Center, 1976.

DeGrazia, Sebastian. Of Time, Work, and Leisure. Garden City, New York: Doubleday and Company, 1964.

Dollarhide, W. E. Soil Survey of the Fallon-Fernley Area, Nevada. Reno, Nevada: University of Nevada, Agricultural Experiment Station, 1975. (Published in cooperation with U. S. Department of Agriculture, Soil Conservation Service, and U. S. Department of the Interior, Bureau of Indian Affairs.)

Eakin, T.; Lambe, R.; and Everrett, D. Hydrologic Reconnaissance of the Humboldt River Basin, Nevada: Water Resources Bulletin No. 32. Carson City, Nevada: State of Nevada Department of Conservation and Natural Resources, 1966.

Eckert, R. E., Jr.; Bruner, A. D.; and Klomp, G. L. "Productivity of Tall Wheatgrass and Great Basin Wildrye under Irrigation on a Greasewood-Rabbitbrush Range Site." Journal of Range Management, 26(40) (1973): 286-288.

Encyclopaedia Britannica, Inc. Webster's Third New International Dictionary. Chicago: G. and C. Merriam Company, 1966.

"Endangered and Threatened Wildlife and Plants: Proposed Endangered Status for Some 1700 U. S. Vascular Plant Taxa." Federal Register, 40(117):24524-24572. June 16, 1976.

Evans, R. A.; Young, J. A.; and Eckert, R. E., Jr. "Herbaceous Weed Control and Revegetation of Semi-Arid Rangelands in the Western United States." Outlook on Agriculture, 6(2) (1969): 60-66.

Executive Office of the President, Office of Emergency Preparedness. Disaster Preparedness: Report to the Congress. Washington, D. C.: Government Printing Office, 1972.

Forest, Range and Watershed Consultants, Inc. An Evaluation of Ecological Impacts of Sierra Pacific Power Company's 230 Kv Transmission Lines - Tracy, Nevada, to Jackpot, Nevada. Reno, Nevada: 1974. (Prepared for SE&A Engineers and Planners, Inc.)

Garrett, J. R.; Pon, G. T.; Arosteguy, D. J. "Economics of Big Game Resource Use in Nevada." Reno, Nevada: University of Nevada, Agricultural Experiment Station, 1970.

Gates, D. H.; Stoddard, L. A.; Cools, C. W. Soil as a Factor Influencing Plant Distributions on Salt Deposits of Utah. Ecological Monographs, 25 (1956): 155-175.

Gordon, C. C.; Tourangeau, P. C.; Bromenshank, J. J.; Carson, C. E.; and Rice, P. M. "Pre- and Post-Operational Investigations into the Impacts of Coal-Fired Power Plant Emissions of the Northern Great Plains." Missoula, Montana: University of Montana, 1977. (Paper presented to National Research Council, Washington, D. C., March 1, 1977.)

Green, E. L. "Studies in the Compositae." Pittonia 3 (1896): 61.

Governor's Office of Planning Coordination, State of Nevada. Directory of Local Planning Organizations. Carson City, Nevada: State Printing Office, 1975.

Hall, E. Raymond. Mammals of Nevada. Berkeley, California: University of California Press, 1946.

Hitchcock, C. L. "Drabas of Western North America." University of Washington Publications in Biology, 11 (1941): 90-91.

Holmgren, A. H.; Shultz, L. M.; and Shultz, J. S. "Proposed Endangered and Threatened Species for the Bureau of Land Management Tonopah District and Adjacent Areas." Reno, Nevada: Unpublished Report prepared for the BLM Nevada State Office, January, 1977.

_____. "Herbarium Search and Literature Review: Survey of Proposed Sensitive Species in Humboldt and Pershing Counties, Nevada." (Unpublished report prepared for Bureau of Land Management, Nevada State Office, August 1977.)

_____. "Herbarium Search and Literature Review: Survey of Proposed Sensitive Species in Lander and Eureka Counties, Nevada." (Unpublished report prepared for Bureau of Land Management, Nevada State Office, November 1977.)

Howell, J. T. "Phacelia glaberrima." Leaflets of Western Botany, 4 (1944): 15.

Hull, A. C., Jr., and Doran, C. W. "A Preliminary Guide to Reseeding Pinyon-Juniper Lands of Western Colorado - Station Paper No. 4." Fort Collins, Colorado: Rocky Mountain Forest and Range Experimental Station, 1950. (Published in cooperation with the U. S. Forest Service.)

Hunt, Thomas H. Ghost Trails to California. Palo Alto, California: American West Publishing Company, 1974.

Institute of Electrical and Electronics Engineers, Inc. IEEE Standard Dictionary of Electrical and Electronic Terms. New York: John Wiley and Sons, Inc., 1972.

Langan, L. N. Soil Survey of the Lovelock Area, Pershing County, Nevada. Reno, Nevada: University of Nevada, Agricultural Experiment Station, 1964. (Published in cooperation with U. S. Department of Agriculture, Soil Conservation Service, and U. S. Department of the Interior, Bureau of Indian Affairs.)

LaRivers, Ira. Fishes and Fisheries of Nevada. Carson City, Nevada: State Printing Office, 1962. (Published for the Nevada State Fish and Game Department.)

Law Enforcement Assistance Administration. Crime in Nevada. Washington, D. C.: Government Printing Office, 1975.

Leonard, Ellen M.; Williams, M. D.; Mutschlecner, J. P.; and Wecksung, M. J. The Visibility Issue in the Rocky Mountain West. Los Alamos Scientific Laboratory, 1977.

Mackey, R. Bruce. "Costs for Rural Community Services in Nevada - An Economic/Engineering Approach." Reno, Nevada: University of Nevada, 1977.

_____. "How to Review a Proposed Rural Subdivision: An Economic View." (Unpublished draft. Reno, Nevada: University of Nevada.)

Morris, William, ed. The American Heritage Dictionary of the English Language. Boston: Houghton Mifflin Company, 1976.

Munz, P. A., and Keck, D. D. A California Flora and Supplement. Berkeley, California: University of California Press, 1973.

Myrick, David. Railroads of Nevada and Eastern California, Vol. 1 - The Northern Roads. Berkeley, California: Howell-North Books, 1962.

Nash, Jay B. Philosophy of Recreation and Leisure. Dubuque, Iowa: William Brown Company, 1960.

National Academy of Sciences. Geochemistry and the Environment, Vol. 1: The Relation of Selected Trace Elements to Health and Disease. Washington, D. C.: National Academy of Sciences Printing and Publishing Office, 1974.

Nevada Bureau of Mines. Mineral and Water Resources of Nevada. Bulletin No. 65. Reno, Nevada: University of Nevada, 1964. (Published in cooperation with the U. S. Geological Survey and the University of Nevada, Mackay School of Mines.)

Nevada Commission on Crime, Delinquency and Corrections. Comprehensive Criminal Justice Plan 1977. Carson City, Nevada: State Printing Office, 1977.

Nevada Department of Conservation and Natural Resources. State of Nevada Air Quality Regulations, as Amended. Carson City, Nevada: State Printing Office, 1976.

_____, Division of Environmental Protection. "Ambient Air Monitoring and Air Quality Trend Report." Carson City, Nevada: State Printing Office, 1976.

_____, Division of Forestry. Letter from Jack C. Fisher, Jr. to John Boyles, District Manager, Las Vegas District, Bureau of Land Management, 1977.

Nevada Department of Education. Research Bulletin, Vol. 18, No. 2. Carson City, Nevada: State Printing Office, 1976.

Nevada Department of Fish and Game. Report of Environmental and Wildlife Investigation: Vol. II, Wildlife Investigation (Humboldt River Upstream Storage Project and Rock Creek Dam Project). Carson City, Nevada: State Printing Office, 1971.

_____. "Statewide Angler Questionnaire." Carson City, Nevada: State Printing Office, 1974.

Nevada Department of Taxation. Local Government Red Book Ad Valorem Tax Rates Budget Summaries for Nevada Local Government, Fiscal Year 1971-76. Carson City, Nevada: State Printing Office, 1971.

Nevada Employment Security Department. Annual Planning Report. Carson City, Nevada: State Printing Office, 1976.

_____. County Labor Force Summary: 1970 and 1974. Carson City, Nevada: State Printing Office, 1974.

Nevada State Board of Fish and Game Commissioners. Classification of Wildlife: General Regulations No. 1, Amendment No. 5. Carson City, Nevada: State Printing Office, 1974.

Nevada State Engineer's Office, Division of Water Resources. Water for Nevada, Reports, 3, 6, 7, 8, and 9. Carson City, Nevada: State Printing Office, 1971.

_____. Water for Nevada, Special Report: Input-Output Economic Models. Carson City, Nevada: State Printing Office, 1974.

Nevada State Highway Department. Master Plan of Rest and Scenic Areas. Carson City, Nevada: State Printing Office, 1967.

_____, Planning Survey Division. 1976 Annual Traffic Report, Nevada Highways. Carson City, Nevada: State Printing Office, 1976.

Nevada State Land Use Planning Agency. "The Cost of Providing County Services to Outlying Developments in Rural Nevada: A Study of the Hilltop Road Area of Lander County Near the Town of Battle Mountain." Carson City, Nevada: State Printing Office, 1977.

Nevada State Parks System. "State Comprehensive Outdoor Recreation Plan." Carson City, Nevada: State Printing Office, 1971.

Paher, Stanley W. Nevada Ghost Towns and Mining Camps. Berkeley, California: Howell-North Books, 1970.

Plummer, A. P.; Christensen, D. R.; and Monsen, S. B. Restoring Big Game Range in Utah. (Utah Division of Fish and Game Publication No. 68-3.) Salt Lake City, Utah: State Printing Office, 1965.

_____; Hull, A. C., Jr.; Stewart, G.; and Robertson, J. H. Seeding Rangelands in Utah, Nevada, Southern Idaho, and Western Wyoming: Agricultural Handbook No. 71. Washington, D. C.: Government Printing Office, 1955. (Published for U. S. Department of Agriculture, Forest Service.)

Regional Planning Commission, Reno, Sparks, and Washoe County. A Conservation Plan; A Population Plan - Washoe County, Nevada. Reno, Nevada: Regional Planning Commission, 1975.

Regional Planning Commission, Humboldt County. "Preliminary Draft: General Plan Background Data for Humboldt County." Winnemucca, Nevada: Humboldt County Regional Planning Commission, 1976.

Richards, L. A., ed. Diagnosis and Improvement of Saline and Alkali Soil: U. S. Department of Agriculture Handbook No. 60. Washington, D. C.: Government Printing Office, 1954.

Robbins, C. S.; Bruun, B.; Zim, H.; and Singer, A. A Guide to Field Identification - Birds of North America. New York: Golden Press, 1966.

Rodney, Lynn S. Administration of Public Recreation. New York: The Ronald Press Company, 1964.

Rollins, M. B.; Dylla, A. S.; and Eckert, R. E., Jr. "Soil Problems in Reseeding a Greasewood-Rabbitbrush Range Site." Journal of Soil and Water Conservation, 24(4), 1968.

Rusco, Mary. "Archaeological Reconnaissance of the Proposed 230 Kv Transmission Line from Tracy, Nevada, to Hunt, Idaho." Reno, Nevada: Nevada State Museum, Central Division of the Nevada Archaeological Survey, 1975.

SE&A Engineers and Planners, Inc. Tracy-Hunt Transmission Project UP&L Intertie No. 2: Environmental Analysis. Reno, Nevada: SE&A Engineers, 1975.

Seelinger, Evelyn. "Archaeological Resources Investigation at the Valmy Power Station Site." Unpublished manuscript. Carson City, Nevada: Nevada State Museum, 1977.

Smith, R. Lander County General Plan. Reno, Nevada: Raymond D. Smith and Associates, 1969.

Snyder, C. T.; Hardman, G.; and Zdenek, F. F. Pleistocene Lakes in the Great Basin. Washington, D. C.: Government Printing Office, 1964. (Published for the U. S. Geological Survey.)

Stark, N. Review of Highway Planting Information Appropriate to Nevada. Reno, Nevada: University of Nevada, Max C. Fleischman College of Agriculture, 1976. (Published in cooperation with the Nevada State Highway Department.)

State of California. California Statistical Abstract. Sacramento, California: State Printing Office, 1975.

St. John, H. "The Genus Elodea, Part I." Research Studies, Washington State University, 30 (1962): 19-44.

_____. "Elodea." Rhodora, 67 (1965): 164-169.

Stebbins, Robert C. A Field Guide to Western Reptiles and Amphibians. Boston: Houghton Mifflin Company, 1966.

Stoddard, Gloria J. Common Environmental Terms: A Glossary. Washington, D. C.: U. S. Environmental Protection Agency, 1973.

Stone and Webster Engineering Corporation. Report on Geotechnical Studies and Design Criteria, North Valmy Station, Nevada. Reno, Nevada: Sierra Pacific Power Company, 1976.

Stuart, D. M.; Eckert, R. E., Jr.: Dylla, A. S.; and Schuman, G. E. "Seeding Coppice Dune Areas in Northern Nevada." Reno, Nevada: University of Nevada Agricultural Experiment Station, 1973. (Published in cooperation with U. S. Department of Agriculture, Agricultural Research Service, Western Region.)

Swenson, H. A., and Baldwin, H. L. Primer on Water Quality. Washington, D. C.: Government Printing Office, 1965. (Published for U. S. Geological Survey.)

"Threatened or Endangered Fauna or Flora: Review Status of Over 3000 Vascular Plants and Determination of 'Critical Habitat.' Federal Register, 40(127):27824-27924. July 1, 1975.

Tidestrom, Ivar. Flora of Utah and Nevada. Contributions from the U. S. National Herbarium, Vol. 25. Washington, D. C.: Government Printing Office, 1925.

University of Chicago Press. A Manual of Style. Chicago: University of Chicago Press, 1969.

University of Oklahoma, Science and Public Policy Program. Energy Alternatives: A Comparative Analysis. Norman, Oklahoma: University of Oklahoma, 1975.

University of Nevada, Reno, Bureau of Business and Economic Research. "Population Projections, Revised." Reno, Nevada: University of Nevada, 1977.

_____, Bureau of Business and Economic Research. "Nevada Inmigration, Income, and Quality of Life." Nevada Business Review. Reno, Nevada: University of Nevada, 1974.

U. S. Army Corps of Engineers. Environmental Inventory and Base Assessment of the Upstream Storage Project in Elko County. Washington, D. C.: Government Printing Office, 1975.

U. S. Congress, House, Committee on Interstate and Foreign Commerce. Energy Conservation: Joint Hearings on Title I of H.R. 14205 and Title IV of Senate Amendments to H.R. 12169. 94th Congress, 2nd Session, July 19 and 20, 1976. (Serial Number 94-132.)

U. S. Department of Agriculture. "Nevada Areas with Adequate Snowfall for Winter Recreation." Reno, Nevada: Soil Conservation Service Snow Hydrology Unit, 1971.

_____. A Universal Equation for Measuring Wind Erosion: Agricultural Research Service Bulletin ARS 22-69. Washington, D. C.: Government Printing Office, June 1961.

U. S. Department of Agriculture, Economic Research Service, and U. S. Department of Commerce, Social and Economic Statistics Administration. OBERS Projections, Vol. 7, Economic Activity in the U. S. Washington, D. C.: Government Printing Office, 1974. (Prepared for the U. S. Water Resources Council.)

_____, Forest Service, Pacific Southwest Forest and Range Experiment Station. Forest Landscape Description and Inventories: A Basis for Planning and Design: Research Paper PSW-49. Washington, D. C.: Government Printing Office, 1968.

_____, Soil Conservation Service. Soil Survey Manual: Agricultural Handbook No. 16. Washington, D. C.: Government Printing Office, 1962.

_____, Soil Survey Staff. Soil Taxonomy: Handbook No. 436. Washington, D. C.: Government Printing Office, 1975.

U. S. Department of Agriculture and U. S. Department of the Interior. Environmental Criteria for Electric Transmission Systems. Washington, D. C.: Government Printing Office, 1971.

U. S. Department of Commerce, National Climatic Center. Climatological Data - Nevada: Annual Summary, 1975. Asheville, North Carolina: National Climatic Center, 1975.

_____, Social and Economics Statistics Administration, Bureau of the Census. County and City Data Book 1972. Washington, D. C.: Government Printing Office, 1973.

U. S. Department of Health, Education, and Welfare, Public Health Service, Health Resources Administration. A County and Metropolitan Area Data Book. (Reported by the National Center for Health Statistics.) Rockville, Maryland: Public Health Service, 1972.

U. S. Department of the Interior, Bonneville Power Administration. Final Environmental Statement, General Construction and Maintenance Program. Washington, D. C.: Government Printing Office, 1974.

_____, Bureau of Land Management. Draft Shoshone Planning Area Analysis, Battle Mountain Bureau of Land Management District. Reno, Nevada: Bureau of Land Management Printing Office, 1976

_____, Bureau of Land Management. Economic Profile for the State of Nevada. Reno, Nevada: Bureau of Land Management, Nevada State Office, 1974.

_____, Bureau of Land Management. Environmental Analysis Record for the Agricultural Program, Lower Snake River Plains of Idaho. Boise, Idaho: Bureau of Land Management, Idaho State Office, 1976.

_____, Bureau of Land Management. Final Environmental Analysis Record, Tracy-Oreana 230-345 Kv Transmission Line Right-of-Way. Reno, Nevada: Bureau of Land Management, Nevada State Office, 1976.

_____, Bureau of Land Management. Final Environmental Statement, Proposed Domestic Livestock Grazing Program for the Challis Planning Unit. Boise, Idaho: Bureau of Land Management, Idaho State Office, 1977.

_____, Bureau of Land Management. Final Environmental Statement, Proposed Kaiparowits Project. Utah: Bureau of Land Management, Utah State Office, 1976.

_____, Bureau of Land Management. Final Environmental Statement, Sierra Pacific Power Company 345 Kv Transmission Line - Oreana, Nevada, to Hunt, Idaho. Reno, Nevada: Bureau of Land Management, Nevada State Office, June 1977.

_____, Bureau of Land Management. Final Environmental Statement, Tucson Gas and Electric Westwing to El Sol to Vail, Arizona EHV Transmission Line Corridor. Phoenix, Arizona: Bureau of Land Management, Arizona State Office, 1975.

_____, Bureau of Land Management. Resource and Land Investigations (RALI) Program: Considerations in Evaluating Utility Line Programs. Washington, D. C.: Government Printing Office, 1975.

_____, Bureau of Land Management. Socio-Economic Profile: Battle Mountain District, Nevada. Battle Mountain, Nevada: Bureau of Land Management, Battle Mountain District Office, 1976.

_____, Bureau of Land Management. Socio-Economic Profile: Winnemucca District, Nevada. Winnemucca, Nevada: Bureau of Land Management, Winnemucca District Office, 1976.

_____, Bureau of Land Management. The Need for a National System of Transportation and Utility Corridors. Washington, D. C.: Government Printing Office, 1975.

_____, Bureau of Land Management. Unit Resource Analyses and Management Framework Plans. Unpublished material from the Battle Mountain, Carson City, and Winnemucca Bureau of Land Management District Offices.

_____, Bureau of Land Management. Wildlife Species Brochures for Battle Mountain, Carson City, and Winnemucca BLM Districts. (Available at respective District Offices and the Nevada State Office, BLM, Reno, Nevada.)

_____, Bureau of Reclamation. Environmental Glossary. Washington, D. C.: Government Printing Office, June 1975.

_____, Fish and Wildlife Service. The Endangered Species Act - Endangered or Threatened Wildlife, as Amended. Washington, D. C.: Government Printing Office, 1973.

_____, Fish and Wildlife Service. Threatened Wildlife of the United States. Washington, D. C.: Government Printing Office, 1973. (Includes amendments published in the Federal Register, Vol. 40, No. 188, September 1975.)

_____, Fish and Wildlife Service. United States List of Endangered Species. Washington, D. C: Government Printing Office, 1974.

_____, Geological Survey. Water Resource Data for Nevada. Washington, D. C.: Government Printing Office, 1974.

U. S. Environmental Protection Agency. "Effects of Sulfur Oxides in the Atmosphere on Vegetation." (Extract from Chapter 5, EPA-R3-73-030, Air Quality Criteria for Sulfur Oxides.) Research Triangle Park, North Carolina: Environmental Protection Agency, 1973.

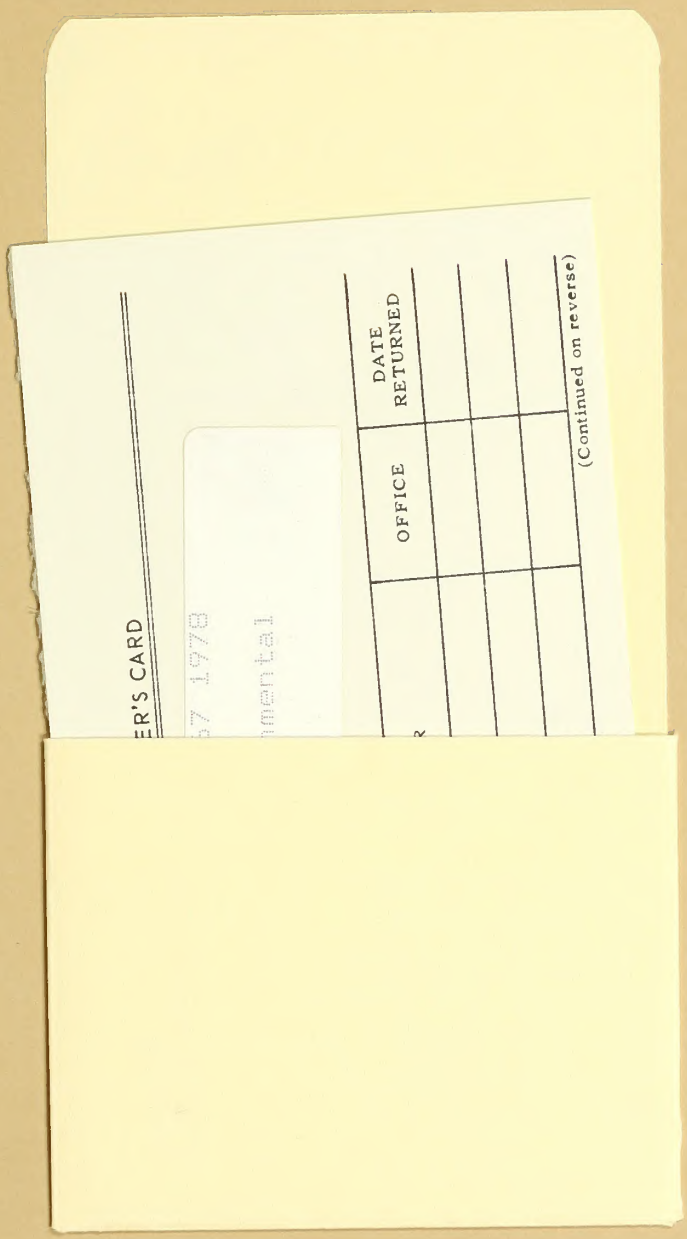
Wernstedt, Frederick. World Climate Data. Lemont, Pennsylvania: Climatic Data Press, 1972.

Westinghouse Electric Corporation, Environmental Systems Department. Environmental Report for the North Valmy Station. Pittsburgh, Pennsylvania: Westinghouse Electric Corporation, March 1976.

_____. "Leachability Studies of the Soils from the Sierra Pacific Valmy Station Potential Cooling and Evaporation Pond Sites." Pittsburgh, Pennsylvania: Westinghouse Electric Corporation, 1975.

_____. Power Plant Site Selection Study for the Sierra Pacific Power Project. Pittsburgh, Pennsylvania: Westinghouse Electric Corporation, 1975.

Willden, Ronald. Geology and Mineral Deposits of Humboldt County, Nevada, Bulletin No. 59. (Published in cooperation with the Mackay School of Mines.)

G. P. O. 789-115/78-42

Bureau of Land Management
Library
Denver Service Center